

Foster a Sustainable Behaviour Using a Gamification Approach: an Exploratory Study

**Bachelor Project submitted for the Bachelor of Science HES in Business
Administration with a major in International Management**

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Declaration

This Bachelor Project is submitted as part of the final examination requirements of the Geneva School of Business Administration, for obtaining the Bachelor of Science HES-SO in Business Administration, with major in International Management.

The student accepts the terms of the confidentiality agreement if one has been signed. The use of any conclusions or recommendations made in the Bachelor Project, with no prejudice to their value, engages neither the responsibility of the author, nor the adviser to the Bachelor Project, nor the jury members nor the HEG.

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Executive Summary

Forecasts predict that at the end of this century world population will reach more than ten billion. This increase will cause an overexploitation of our ecosystem. Already now there are some countries that consume more resources than their lands can provide, while some others live in poor conditions. With the increase of the population, we will put even more pressure on our ecosystem and some countries will suffer more than others. For this reason, a new model of development is necessary, and a sustainable one is desirable.

In order to have a sustainable development all the actors of the society are trying to find solutions and in the future they will have to try even harder. It will be not enough that just a single actor will do something but all the society together will have to contribute to this change.

This paper tries to evaluate whether a model based on gamification technique would motivate people in behaving in a more sustainable way. Past researches declare that consumers are aware of the sustainable issue and they would like to behave in a sustainable way. However, their willingness is not always transformed into a sustainable behaviour. Therefore, it has been developed a model which use game mechanics to drive consumer behaviour toward a sustainable one.

Motivation is crucial for changing people behaviour and gamification, which implies the use of game elements and mechanics in other contexts, has proved to be a powerful motivational tool. Hence, a sustainable gamified system has been developed on a paper prototype and has been tested by ten potential users. The target of the gamified system are students.

Data collection has been conducted in the following way: first, it has been developed a gamified system and then it has been designed on a paper prototype. After that, potential users of the tool have tested the model and have answered questions in a semi-structured interview in order to understand if the gamified system would help them doing more sustainable actions.

The main results tell us that a gamified system helps to motivate students in having a sustainable behaviour. However, it is mainly effective for people that have already a strong sustainable attitude. For engaging the one who have weaker sustainable value, an external reward is needed.

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1. Introduction

1.1 Context

According to the United Nation, the world population has reached 7.2 billion in July 2013. In accordance with the latest UN forecast, this number should reach 9.6 billion by 2050 and 10.8 billion by 2100 (United Nations, 2012b). Everybody will have to satisfy their basic needs such as food, drink, have a safe house, education, health, etc. On the other hand, resources available on the earth are not unlimited. In order to satisfy the needs of every human being, we have to rethink our way of living and our model of development.

Already now, some countries consume more resources than their lands can provide. For example, according to Global Footprint Network (2014), *“if everybody lived with the same lifestyle of an average American we would need 5 planets”*. This is also possible because other countries use less resources and leave in poor conditions. One important thing that should be done, it would be to rebalance the differences between wealthy and poor countries.

The example above is known with the term Ecological Footprint which is defined by the WWF (2014a) as:

“[...] the impact of human activities measured in terms of the area of biologically productive land and water required to produce goods consumed and to assimilate the wasted generated. More simply, it is the amount of the environment to produce the goods and service necessary to support a particular lifestyle”.

According to Global Footprint Network (2014), at the moment we are using worldwide the resources for 1.5 planets and some scenarios predict that in 2030 this number will reaches 2 planets.

Now, if we combine the variables “population forecast in 2050” and the “use of 5 planets by American”, it is easy to understand that we have to change something in our development model. This is why we increasingly hear the word “Sustainability” and “Sustainable Development”. Indeed, our current model is:

- Environmentally not sustainable
- Economically unequal

- Socially insufficiently participatory (Maeder, 2013)

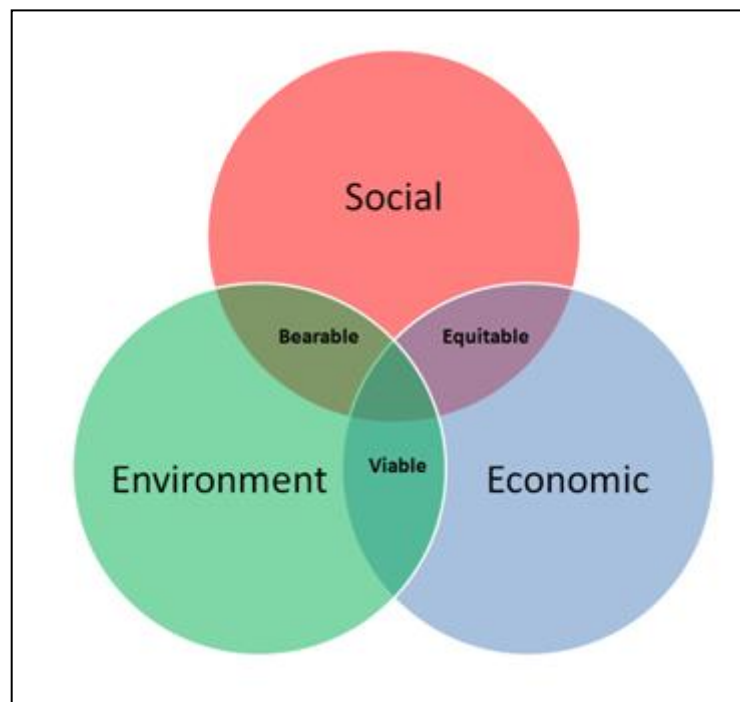
1.1.1 Sustainable Development

The term Sustainable Development has many definitions but it was used the first time by the Brundtland Commission in 1987 and it reads as follow: “[...][development] that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nation, 1987). This definition encompasses economic and social development as well as the importance of preserving the environment and the resources. In other words, our development should include every human being and it should not compromise the environment.

The three pillars of sustainability

The report written by the Brundtland Commission highlighted how economic, social and environment are interconnected and are the foundation of a sustainable development. Public and private actors should not focus their attention only on one dimension but they should consider the three pillars together.

Figure 1 – Three sustainable development pillars



Source: Modified from Sustainability, Wikipedia

Economic

This pillar refers to the ability to have enough resources to meet the needs of human beings in order to have a good quality of life (FSO, 2014). For a country this is measured with the employment rate, the GDP and other economic indicators (Action Town, 2010). Even if the three pillars should have the same weight, in reality, most of the time the economic one is put as a priority and it is usually more important than the other two pillars (i.e. social and environment).

Social

The social dimension is how the resources that we produce are distributed among the population (FSO, 2014). It includes the term fairness and the aim is to reduce social inequalities between human beings, to reduce poverty as well as to give access to education and health to everybody (Action Town, 2010).

Environment

It refers to the ability of preserving the environment and the resources for future generations (FSO, 2014). In this regard, we should try to pursue an economic and a social development without damaging the ecosystem. The goal is to ensure clean soil, water and air, preserve the health of the planet and use the resources in the most efficient way (Action Town, 2010).

1.1.2 Engaging in sustainability

Everybody recognises that our development model is not sustainable any more. For this reason, all public and private agents are putting more efforts to find new patterns of development, especially a sustainable one. At a macro level, the United Nations set global goals and targets to ensure political engagement for a sustainable development. For example, in 2012, the member states of the UN agreed in Rio de Janeiro on starting a process to define sustainable development goals (United Nations, 2012a). Then, every country is responsible to change the rules of the games and adapt them according to the goals set by the UN. For instance, Switzerland has decided its priorities in its Sustainable Development Strategy 2012-2015 (Swiss Confederation, 2012). Private businesses are also moving toward this direction and they are engaging in behaving with more sustainable practices. A lot of multinational companies are now releasing a sustainable report in order to inform all the stakeholders about their sustainable practices (Global Reporting Initiative, 2014).

Despite the efforts major players are doing, the results are not satisfactory. For example, carbon dioxide emissions from burning fossil fuels, which is a major contributor to climate change, have been increasing in the last 20 years. The consequence of the global warming are the melting of glaciers which have important consequences on water supply, energy supply, vegetation, natural disasters, etc. Other indicators which show that we are not moving to the right direction are the loss of biodiversity and the overexploitation of natural resources (just to mention a few of them) (UNEP, 2012).

New solutions are desirable and the only commitment of governments and corporations is not enough. A good way to solve the sustainable issue would be to engage consumers in having a more sustainable behaviour. As a matter of fact, their choice has a considerable impact on the society and on the environment.

1.1.3 Foster a sustainable behaviour

When consumers decide to consume certain products or to have a specific lifestyle rather than another, their choices have direct or indirect consequences on the society and on the environment (Jackson, 2005). Therefore, the role of the consumers in the *sustainable shift*¹ is crucial and motivating consumers towards a sustainable behaviour is extremely important.

According to Jackson (2005), motivating people to behave in a more sustainable manner is not simple. The behaviour of individuals is influenced by the social and institutional contexts. Indeed, the rules of the game and the behaviour of others around us play an important role and we behave in an unsustainable manner despite “[...] *our own best intentions*” (Jackson, 2005).

The question now is: how can we change the behaviour of people toward a more sustainable one? This research proposes to answer this question by using an innovative approach which tries to motivate people adopting a sustainable behaviour. This approach is based upon gamification theories and uses game elements to stimulate sustainable actions. Before explaining into details this technique, it is important to have a look at some important trends and challenges that our society is experiencing or will face in the future.

¹ Sustainable shift: defined by the author of this research as the “*shift between a conventional society focused only on satisfying needs and desires to a sustainable one which consider the three sustainable dimension together when producing and consuming goods*”

1.2 Global Challenges and Trends

Before going into the core of this research, it is worth mentioning certain challenges that our society is facing and highlighting some important trends. After having analysed the macro environment with the PESTEL model (see infra, Appendix 1), the following aspects are the most relevant for the interest of this study.

Populations and middle class increase

As stated in the introduction, world population should exceed 9.5 billion by 2050 and most of this increase will happen in developing and emerging countries. At the same time, most of the economic growth will happen in these countries and many people will reach the middle class standard of living (WBCSD, 2010). If these people will live with the same lifestyle we are living now in western countries, there will not be enough resources for everybody without changing our model of development.

Deterioration of ecosystem

According to the Millennium Ecosystem Assessment, almost two-thirds of the ecosystem has been degraded in the last 50 years. This negative trend could continue significantly in the first half of this century (Millennium Ecosystem Assessment, 2005).

WWF reported that the factors which have the most ecological footprint are food, transport, household equipment and housing. Food, transport and energy sectors accounts for 63% of the global ecological footprint, while 30% of the carbon emissions are caused by housing (WWF, 2014b).

Consumers: gap between attitude and behaviour

Most of the people are well aware of the sustainable issue. For this reason they are willing to take some actions and behave accordingly. Nonetheless, their willingness is not always transformed into a sustainable behaviour (WBCSD, 2009).

Studies have shown that consumers are shifting their consumer values and ideals and are willing to buy products which are produced according to sustainable standards. Unfortunately, when it comes to the actual buying they do not act in this way. The main reasons because this happens are: lack of understanding, selfishness linked to their current lifestyle and perceived higher costs (WBCSD, 2009).

Social Networks

A trend that we take into consideration for the sake of this research is the one linked to the use of internet and more precisely the one associated to social networks.

Nowadays, social networks have a relevant presence in our life and almost everybody is registered in one of them. When Facebook started in 2004, there were only few people who knew what it was. After 10 years, everybody knows about it and in 2013 it reached 1.23 billion monthly active users (Sedghi, 2014). Other social networks which are also very popular are Twitter and Google+ but there are many others. People like to be always connected, informed and share what they are doing all the time.

If we consider also the new generation, defined by Zichermann and Linder (2010) “*the Generation G*” (i.e. young generation born between the years 1998 and 2000), the social network trend is even more important. This generation has grown up with Internet and social networks. In the US, more than 7 million of them play on a regular basis at games on social networks. Zichermann and Linder (2010) predict that for this generation there will be a penetration rate of 100 percent for social networking.

Videogames

According to PHD (2013), videogames are very present in our society. Worldwide, we are playing 7 billion hours weekly. One billion of people spend at least one hour daily on average playing videogames. While in the past these games were played alone, now with Internet is possible to play these games with others users. These types of games are called Massively Multiplayer Online Role Playing Game (MMORPG).

In 2005, a research affirmed that 60 % of minors play video games every day. After two years, another study stated that this number was growing. The research showed as well that many children by the age of 10 have already experienced the game on mobile phones and handheld games (PHD, 2013).

The author of this research remembers that in the summer 2014, he met for the first time the daughter (three years old) of his cousin. He was impressed because this young girl was already playing games on a tablet. What was incredible was the simplicity that she had in using the device. Another surprising thing was that she was playing games with an educational aim. For example, she was already learning the alphabet and she was able to read the time on a traditional clock.

2. Gamification

In the introduction of this research, it has been highlighted that our Earth is under pressure and a new model of development is desirable. As it has been shown, although people are willing to behave in a more sustainable way, they hardly manage to do it. Therefore, the challenge is to find a way to transform the intention to behave in such a way into an actual behaviour. This research will try to motivate people to have a sustainable behaviour using a gamified system. This approach is known with the term gamification

2.1 Definition

First of all, it is important to define this unusual name. Zichermann and Cunningham (2011) define gamification as “*The process of game-thinking and game mechanics to engage users and solve problems*”. I personally prefer the definition given by Werbach and Hunter (2012) which read as follow:

« *The use of game elements and game-design techniques in non-game contexts* ».

Thus, in gamification there is the presence of some “game elements”. For instance, when we play tennis the elements are the net, the ball, the racket, the notion of points and so on. For Tetris, the elements are the blocks with different shapes, the creation of the lines, the speed that increases when the user levels up, etc.

The second aspect of the definition is “game-design techniques”. This is how a game designer decides to put the different elements together.

Finally, the definition suggests that there is a “non-game contexts”, meaning that the game elements can be used out of a game experience. For instance, game elements could be used to motivate employees or engage customers. Therefore, gamification is not a game, but it is used in a real world situation. Users are not playing at a PlayStation, but they are doing real stuff motivated by these game elements.

For Werbach and Hunter (2012), there are mainly three non-game contexts that gamification could be used: internal gamification, external gamification and behaviour change. Internal gamification is used within an existing organisation: for example to improve the productivity of the employees of a company. External gamification is about your clients or the potential customers. It could be used to increase the loyalty of the customers and increase their engagement. Finally, behaviour-change gamification tries

to shape positive new habits among people. Examples are having a healthy lifestyle, doing more physical activity, learning at school having fun, etc. These new habits are usually “[...] *desirable societal outcomes* » (Werbach, Hunter, 2012).

In the following section, there are interesting case studies about gamification.

2.2 Gamification case studies

In this chapter there will be great examples that help understanding how companies managed to use the gamification technique. The first example is about a call-centre that managed to improve the motivation of its employees. The second one show how gamification managed to improve the loyalty of customers and the final one explains how a sport company managed to motivate its clients in having a new behaviour.

Internal gamification: LiveOps

LiveOps is a call-centre that hires independent agents to deal with customer service. The company has been able to transform a boring job such as a call-centre agent in a completely new and interesting experience. They implemented game mechanics in order to motivate their agents (Bunchball, 2014).

In using points, badges and leaderboards, they were able to reach considerable results. For example, when agents finish a training module, they receive badges and points, there are rewards points for better call conversation and agents are put on a public leaderboards where other users can see who are the best performers (Bunchball, 2014).

The level of the service has improved by 10 %, the average time to answer a client decreased by 15 % and the performance of sales have improved (Werback and Hunter, 2012).

External gamification: Frequent Flyer Program

Many airlines companies offer the frequent flyer program (FFP). FFP is a loyalty program which allows travellers to cumulate miles that correspond to the distance they have flown. Then, the miles can be redeemed for other trips or for other benefits such as priority in lines, class upgrades, access to the lounges of the airports and additional services (Frequent-Flyer program, Wikipedia).

Airlines companies have managed to use game mechanics in a very effective way. For instance, miles correspond to the points in a game and the different levels are the class (e.g. business class, first class, economy). In addition, travellers show their status

when they use the VIP lounges, the priority access and so on (Zichermann and Linder, 2010).

Thus, airlines companies have managed to motivate travellers to buy flight tickets using game mechanics.

Behaviour change gamification: Nike+

Many people are aware that doing physical activity is positive for their mental and physical health. However, when people have to do sport or going to run they lack in motivation.

Nike managed to develop a system (i.e. Nike+) that motivates users to go running. The technology of Nike+ is able to track how fast people run, how far they run, the time they run, etc. Then, users can compare their results against themselves, against other runners in a leaderboards, can form group and can share their results on social networks. In addition, there are points, challenges and other game mechanics that motivate users to do physical activity (Werbach and Hunter, 2012)

Since its inception, users have burned 12.8 billion calories and have done 85 billion steps (Nike, 2014)

By using gamification technique, Nike managed to increase brand loyalty and it is a good example of how gamification managed to motivate people going to run.

2.3 Situation to use gamification

Gamification is a way to stimulate a desired behaviour. Werbach and Hunter (2012) propose that there are three main activities where motivation plays an important role: creative work, mundane tasks, and behaviour change. This research will focus only on behaviour change.

The authors suggest that behaviour-change is needed when “[...] *people understand something is good for them but have hard time doing it*” (Werbach and Hunter, 2012). A good example is physical activity. Most of us understand the benefit of physical activity and would like to practice it but only a few are actually doing it. The main reason is because people hardly find the motivation. Another good example is sustainability: although people are always more sensitive to the sustainable issue and they state that they would like to have a more sustainable behaviour, in reality only a minority is acting in this way.

The challenge here is to find what motivates people and in this regard gamification has proved to be a good tool to engage people in “doing things”.

2.4 Motivation

Understanding what motivates people is important to achieve certain objectives. For example, there are some people that are motivated by their salary when they are working. Some others are motivated by other factors such as the type of work, the atmosphere, the flexible time and so on. If you know that your employees are motivated by money, you will pay a good salary. In this example, employees are motivated by an external factor because people work knowing that they will get a salary and eventually a bonus.

Let's assume now that you really like football and you want to go and watch the world cup in Brazil. This motivation is internal and you go there and pay the flight ticket and the entrance at the stadium because you want to do it. This motivation is different than the one expressed above because it comes from the activity itself and not from an external factor.

When a person is motivated by an external factor is called extrinsic motivation (e.g. salary), while when a person wants to do something because one feels involved in the activity is intrinsic motivation (e.g. world cup) (Deci and Ryan, 2000).

A psychology theory which suggests that extrinsic motivation is very important to motivate people doing things is behaviourism. According to this theory, a reward or a punishment is what people need to make things. Therefore for behaviourist, human beings respond only to external stimuli (Werbach and Hunter, 2012). By contrast, there are cognitivist theories that state that motivation is something that human beings have already inside and that the external environment has to support this internal motivation. This theory is known with the name “Self-Determination Theory” (Werbach and Hunter, 2012).

2.4.1 Self-Determination Theory

According to the Self-Determination Theory, people have intrinsic psychological needs that are the source of self-motivation. These needs are: needs for competence, need for relatedness and need for autonomy. This theory, developed by Deci and Ryan, suggests that if individuals manage to fulfil these three needs they become intrinsically motivated and they are self-determined. Their thesis is based on the assumptions that human beings are driven by the internal desire for growth and therefore is important to

provide supportive condition to enable this growth. If a person is able to experience “autonomy”, “competence” and “relatedness” performing a task, she will be more engaged and will be intrinsically motivated (Werbach and Hunter, 2012).

In order to better understand these concepts, definitions and examples are provided in the following paragraphs.

Competence

Sometimes also defined as “mastery”, competence is linked to the difficulty of the task and the ability of the person to do something which requires specific skills: learn how to swim, learn how to drive or being able to solve a mathematical problem (Werbach and Hunter, 2012).

Autonomy

This is experienced when an individual has the feeling of being in control of her own life and she has the power to determine her behaviour. If a teenager is forced by her parents to do a sport rather than another, it will not be the same as if this decision had been taken by the teenager because she really wants to do it (Werbach and Hunter, 2012).

Relatedness

It is the social dimension of the Self-Determination Theory. Human beings have a strong desire to stay with others and to share their experience with colleagues, friends, family, etc. For example, when a person gets a promotion at work, she is very happy to share this with her family (Werbach and Hunter, 2012).

2.4.2 Motivation and games

Now that it is clear what motivates human beings “to do things”, it is important to understand the relationship between motivation and games.

As we have mentioned, activities that satisfy one or more of the need for “competence”, “autonomy” and “relatedness” are inclined to be intrinsically motivated and people will do these activities because they want to do them. Games are good examples of the Self-Determination Theory. A person usually plays a game because she wants to play and not because someone forces her to play (it is an autonomous choice) and she decides how and when she wants to play. When a gamer is able to level up in a game, she has a sense of mastery or competence and when we can share our results or even

play against other people, we have a good feeling (i.e. relatedness) (Werbach and Hunter, 2012).

To better understand what drives people when they play a game, there is a theory developed by Richard Bartle. In his research, he found out that there are mainly four types of players and it is important to consider their personality when a game or a gamified system is designed.

2.4.3 Types of players

According to Bartle (1996), there are mainly four types of players: Killers, Achievers, Socialisers and Explorers. The distinction between the players is not mutually exclusive. Indeed, every player has some attributes of each of the four types of players at the same time. On an average, people have the following split:

- Socialisers: 80 %
- Explorers: 50 %
- Achievers: 40 %
- Killers: 20 % (Zichermann and Cunningham, 2011).

Socialisers

These players are engaged in a game mainly for the social interaction. The game is the social context or the background that serves to communicate and relate to other people. They definitely prefer multi-player games rather than single-player games. Relationship is key for them and they usually like observing, sympathising, communicating with the other members of the community (Bartle, 1996).

Explorers

Explorers are interested in discovering new things. For them the final objective is not winning or scoring points but the experience to get there. They need to find out new stuff and then report back to the community (Bartle, 1996).

Achievers

These types of gamers are interested in the competition, in collecting points and levelling up. They have little interest in the final reward but they are more interested at building and maintaining their reputation. The fact that they have been able to reach that specific level or that amount of points is what satisfy them (Bartle, 1996).

Killers

Killers are comparable to achievers because they like to win. They like to impose their will on others and competition is very important. For them, it is important that they win but also that others players lose. They also like the fact that others players can admire them when they beat an opponent (Bartle, 1996).

3. Analysis

To foster a sustainable behaviour, it has been designed a model that has the goal to make people doing more sustainable actions in their daily live. This model is a gamified system and it has been built using gamification techniques. The model is still at a prototype stage and it has been created on paper. If the outcome of this study will show positive results, the gamified system could be implemented as an app for mobile phones and tablets and/or as a website.

3.1 Objective of the study

People understand that sustainability is a serious issue but they have hard time in having a proper sustainable behaviour. The objective of this study is to check whether a gamified system would help users in having a more sustainable behaviour in real life.

3.2 Target and sample

The target of this study are students of the HES-SO, the University of Applied Sciences and Arts Western Switzerland. The choice of this target has been decided mainly for four reasons. The first one is because at the moment the HES-SO does not include in its sustainable strategy an important stakeholder like students. Apart from offering some courses related to sustainability or integrating this subject in some courses, there is not a strategy which tries to change the behaviour of students in an effective way.²

Secondly, the role of universities in the society should also have a higher educational aim. They should not only provide the tools to students for a future career, but they should also educate them to be responsible citizens. Historically, universities have led the changes in society through scientific discovery but also through the education of future important actors of the society (Lozano, 2006). Therefore, also in the field of sustainability, universities should play the role of pioneer and shape the behaviour of students into a sustainable one. According to Cortese (2003), universities are a miniature community of the society. Thus, the way that they conduct their activities is an important example for the whole community. Students should be aware of the sustainable issue and they should be “[...] *actively engaged in the practice of environmentally sustainable living*” (Cortese, 2003). He continues affirming that a school that has sustainable practices in the daily activities and cooperates with the community but does not include the students in this process will lose 75 percent of the

² Interview by e-mail with Paolo Baracchini, Professor of HEG, 28th April 2014

effectiveness of its actions (Cortese, 2003). A good example is a professor in the University of Hawaii who has developed a system to motivate students to have a sustainable behaviour. Hawaii is heavily dependent on foreign oil and this could have several negative consequences on the life in Hawaii. Therefore, this professor has thought to educate students on sustainability and sustainable practices in order to change their behaviour and share their knowledge with the other members of the community. (Kukui Cup, 2011).

Furthermore, students are a suitable target for this study. Indeed, they are highly connected with their smart phones and they are always on social networks sharing their life. In addition, they are more aware about sustainability than past generations and they are the “future generation” that should be concerned about the sustainable issue.

Finally, the HES-SO would have some benefits as well. Indeed, it would be recognised as a school that cares about sustainability and might be able to have an added value compared to other universities. According to Cortese (2003), a university that offers sustainability as an important part of the educational program might be able to attract students and funding.

The prototype has been tested on 10 students who come from different regions of the world.

3.3 Methodology

The methodology used for this research is the exploratory research, which allows to explore and discover new and unknown concept, phenomenon or field.

In the specific case of the research, the new concept is the gamified system which has the objective to motivate users to behave in a more sustainable way.

The first step was the development of a gamified system (see infra, Chapter 4, Living Green). Then, on a second stage, it has been asked to potential users to test it and was asked their feedback.

The collection of the data has been divided in the following phases:

- Phase 1: Define the personality of users and their attitude towards games and social networks through a questionnaire (see infra, 3.3.1 Questionnaire)
- Phase 2: Ask users to perform activities and interact with a paper prototype (i.e. the gamified system) and observe them (see infra, 3.3.2 Paper Prototype Test)

- Phase 3: Conduct a semi-structured interview (see infra, 3.3.3 Semi-structured Interviews).

3.3.1 Questionnaire

The first activity users had to perform was answering a questionnaire on social networks and games (see infra, Appendix 3). The objective of the questionnaire is to understand whether users use often social networks and play games. In addition, some questions have the target to define the type of players users are. The answers of the questionnaire will enable to see whether there is a correlation between the type of gamers and the type of answers provided by participants at phase 3.

3.3.2 Paper Prototype Test

This phase is at the core of the research. By using a paper prototype, users interact with the gamified system and have the opportunity to test it. The objective is to make the experience and the interface for users as realistic as possible.

Paper prototyping method

Paper prototyping is a method used for testing user interfaces. First, the prototype is hand-sketched on a paper, then it is tested on several users and finally is adjusted according to the users' feedback. According to Snyder (2003),

“Paper prototyping is a variation of usability testing where representative users perform realistic tasks by interacting with a paper version of the interface that is manipulated by a person “playing computer”, who doesn’t explain how the interface is intended to work.”

Thus, the idea is to reproduce the screen of a mobile phone, tablet, screen of a computer on a paper and ask to future potential users to use it as if it was a real one. In Appendix 7, there is an example of a paper prototype.

When the prototype is tested by users (i.e. usability test), there are usually many people involved in the process: the user itself, the facilitator, the “computer” and the observer. The facilitator is the one who guides the user in her experience with the interface: she asks the user to perform the activities and supports the user when needed. The “computer” is the person who is in charge to make the interactivity of the prototype. Her role is to move the pieces of paper when the user clicks on an item and

to change the different screens. Finally, there is the observer who takes notes and sees what the reaction of the user is (Snyder, 2003).

Paper prototyping has many advantages. First of all, it is cheaper compared to a real version of the tool you want to implement. It is not required an IT specialist at an early stage and any person can create the tool. Secondly, it gives already valuable feedback from users and a developer can understand at the very beginning what are the elements to be changed, modified, adjusted or eliminated. Then, it is very easy and quick to modify the first version because all the elements are usually sketched on a paper by hands (Snyder, 2003). In addition, this method allowed me to be creative and to develop alone a tool that I would have never developed if I had to do in reality because of my lack of skills in IT.

The design, development, test of the paper prototype is based on the book “Paper Prototyping: the Fast and Easy Way to Design and Refine User Interfaces” by Caroline Snyder. This book is a very well written guide to create paper prototyping and test them. I have not strictly followed all the advice given in the book, but I have adapted to my needs. For example, I have been facilitator, computer, and observer at the same time, when usually in a usability test all these roles are performed by different people. Another advice that I have not followed is “adjusting the prototype after each test”. I decided to do all the usability tests with the same prototype, without adapting it, and at the end I have drawn conclusions based on all the usability tests.

3.3.3 Semi-structured Interviews

After users will have performed the activities with the prototype, they will have to answer some questions about the experience with the gamified system. The semi-structured interview (see *infra*, Appendix 21) should enable to find out whether the gamified system is an effective tool to change the behaviour of people toward a sustainable one. In addition, it should highlight what are the single elements (i.e. “game mechanics”) of the model that need to be modified, adjusted, eliminated or some others elements that need to be added.

The semi-structured interview was chosen because it allows the respondent to answer the questions freely and to bring up new ideas. A set of potential questions have been created for each subject that need to be checked but not all the questions have been asked. Indeed, Appendix 21 has served as a guide and as a framework of thematic to be investigated.

The objectives of the questions were the following:

- Have a general feedback about the gamified system and on the experience (gamification and paper prototype)
- Check whether the gamified system is user friendly or not.
- Evaluate whether the gamified system is an effective tool to motivate users to do sustainable actions
- Verify whether users would use the gamified system if it were implemented in real life
- Receive feedback on the individual game mechanics

On the one hand the semi-structured interview allows the respondent to give valuable and open feedback without having any type of limitations when answering. On the other hand, the results of the semi-structured interview are open to interpretation and they do not give precise answers on the selected theme. Therefore, it was asked to users to answer as well a short questionnaire. The objective of it was to have a rating on the topic discussed in the semi-structured interview.

4. Living Green

Living Green is the name of the gamified system that has been created for this research. Users can mainly decide to do three things: the Projects, the Green Trivia and the Community.

In the **Projects** users can decide to perform several sustainable activities. The **Green Trivia** is a quiz where users have to answer some questions about sustainability and in the **Community** users can interact with other users and discuss about sustainability.

Before explaining into details the content of Living Green, it is important to define a term that will be used extensively in this chapter: “game mechanics”.

Game mechanics

When a gamified system is designed, the first elements that are considered are the game mechanics. According to Zichermann and Cunningham (2011), “*Mechanics make up the functioning components of the game*”. Thus, mechanics are the different parts of a game such as points, levels, badges, challenges, etc.

In the following sections, it will be explained all the different mechanics used for building the gamified system for this research.

4.1 Projects

When users decide to go in the *Projects*, they can choose to participate at several projects (see infra for more details, 4.1.2 Types of projects).

In the projects, users commit to do sustainable actions in real life. For example, in the project Foody they can commit that they will buy organic eggs. It is just a commitment and users will not have to prove that they have really bought organic eggs but it is based on self-reporting. At the same time, Living Green will not be able to check whether users are really doing the sustainable actions or not.

4.1.1 Assumptions about the actions

The idea behind the actions in the project section is that it gives valuable tips about sustainability to users. It works as an advisor who suggests users about sustainability. In this way, when users will be confronted with the same activity in real life, they will remember what it has been suggested by Living Green and they will do the sustainable action. The next paragraph offers an example of this concept.

A person may have the wrong habit of throwing away a piece of paper in the rubbish bin. This person may be warned about this bad habit and be suggested to recycle the paper instead. If this person is continuously warned to recycle the paper, at some point the person will automatically recycle the paper. The same happens in Living Green and in its projects: users commit to engage in sustainable behaviour and at one point they will automatically behave in such a way.

A company that has developed already a similar tool to promote sustainable behaviour among participants is Practically Green. The concept is similar to the one developed for this research: users commit to do sustainable activities and it is based on self-reporting. Practically Green agrees that with the self-reporting system is not possible to control whether users do or not the actions. However, it affirms that even if users do not always do the actions they claim it is a good way to educate them. In addition, after a while when a user will be confronted with the sustainable issue, she will know what is the best conduct and will behave accordingly. Let's give an example to explain it. A user commits to switch off the computer when she leaves working. It is possible that at the beginning she will not do it, but after a while she will realise that it is not an action that requires so much effort and therefore she will do it.³

This system of self-reporting implemented by Practically Green has had tremendous results. According to Werback and Hunter (2012), in less than one year, this system has cut 14 billion tons of carbon dioxide emissions, reduced the consumption of water by around 95 million litres, recycled 900,000 kilogram of garbage and saved 6 million kilowatt hours of electricity.

4.1.2 Types of projects

The decision of the topics of the projects has been decided by the author of this research after consulting several sources. They are based on different sustainable issues, and as stated above, the objective is to motivate users to have a sustainable behaviour. The choice of the subjects has been chosen after considering which daily activities have an impact on the environment and on the society.

WWF (2014c) suggests that there are the following topics where individuals can have an impact: *drink and food, building and clothes, work and school, free time and holiday, waste and recycling, garden and balcony, investment and retirement, fashion and cosmetics*. Ecogeste.ch (2014) proposes the following domains: *air, food, biodiversity, office, construction, waste, water, energy, society and transport*. Vedula (2014), a

³ Interview by phone with an employee of Living Green, 26th February 2014.

French consulting company in the field of sustainability, suggests the following areas: *biodiversity, climate change, citizenship, consumption, waste, mobility, water, energy, free time and health.*

In Living Green, users can choose to participate at the following projects:

- Energy savvy
- Mobility
- Foody
- Water
- Second life
- Informed buyer
- Move your body

Here below there is a short explanation of the projects and in Appendix 2 is possible to find the associated activities.

Energy savvy

Energy consumption – electricity and heat produced with fossil fuels – is an important cause of the increase of the greenhouse gases emissions which contribute to climate change (EPA, 2013).

This project aims to make consumers more aware about this issue and try to give valuable tips on how is possible to reduce the impact on the environment.

Mobility

Another important contributor of the climate change is transport. Depending on the type of transport mode that people decide to use, there will be a different impact on the environment. For example using a car, instead of a bus or a train, will generate more carbon dioxide (Mobitool, 2014). In addition, the current transport system reduces the possibilities of doing physical activity which has a negative effect on the health of people (see in this chapter the “Move your body” project for more details).

The project “Mobility” suggests different solutions in order to decrease the impact on the environment as well as it shows the positive effects of doing physical activity.

Foody

Food is indispensable for our life. Producing and consuming food has an important impact on the world’s resources and on the environment (European Commission, 2014a).

Another important part of this project is about healthy food. Indeed, an unhealthy diet can lead to have chronic diseases (WHO, 2014a).

This project gives advises on healthy diets and explains how the food is produced and what is the impact on the environment and on the society.

Water

Maybe not a major issue in Switzerland but in some other part of the world it is, water is another fundamental resource for human being (UN-Water, 2014). Understanding the importance of water and behaving consequently is what it will be possible to find in this project.

Second life

There is still a lot of waste that is either burnt by incinerator or disposed into landfills. Both methods for disposing waste have a negative impact on the quality of the air, the water and the soil (European Commission, 2014b).

This project tries to motivate people to use fewer resources, to recycle more and to reuse products as much as possible.

Informed buyer

When goods are produced, they can have many effects on the society (i.e. working conditions of workers) and on the environment (i.e. use of resources, waste production, etc.). Consumers can reduce the negative effects by being aware of these impacts and accordingly, they can buy goods which are produced in the most responsible and sustainable way (Guide des achats professionnels responsable, 2014)

Move your body

As for the Foody project, the last project is about health. Physical activity can have significant benefits for health (WHO, 2014b). Having a healthy lifestyle should be a result of sustainable development and at the same time, healthy people will be able to contribute to have a sustainable development (WHO, 2014c).

4.1.3 Motivating a sustainable behaviour

The activities within the projects are the desirable behaviours and users will be motivated by a point system. Every time that a user will commit to do a sustainable activity, she will receive some points. Before looking at how the point system of Living Green is designed, it is explained what the literature tells about points.

4.1.4 Points

Werbach and Hunter (2012) suggest that points are important in a game for the following reasons:

- points tell the user how well is performing
- assuming there is a prize, users know how many points they need to win something
- assuming there is a reward, users know how many points they need to get the reward
- points are a good feedback system and show at every activity that the user is going in the right direction
- in a game with other players, it shows to other users how a player is playing and could be an indication of status
- finally, points are good for the game designer because they are easy to analyse and they allow to understand the users' behaviour

According to Zichermann and Cunningham (2011) there are five points systems. For the design of this model, two types of points systems have been used: *Experience Points* and *Redeemable Points*.

Experience points are the most important types of points and are used to guide a player during the experience. Experience points systems never decrease (they just go up) and are not redeemable. In Green Living these points are called "*Green Points*".

The second point system used in Green Living is the redeemable points. Users expect to convert these points with other things. They are similar to loyalty program where users first earn the points and then use them ("earn and burn"). In the model used for this research, these points are known as "*Coins*" (see infra, 4.2.1. Coins).

Green Points

In Green Living, Green Points (i.e. experience points) are the points that are assigned when users do sustainable actions. For example, if a user decides to recycle pet, she receives 5 Green Points and if she chooses to use public transport regularly, she gets 30 Green Points. The points are correlated with the difficulty of the actions users have to perform. The more efforts they put, the more points they receive. In Appendix 2 is possible to see the type of actions users have to perform and the associated points.

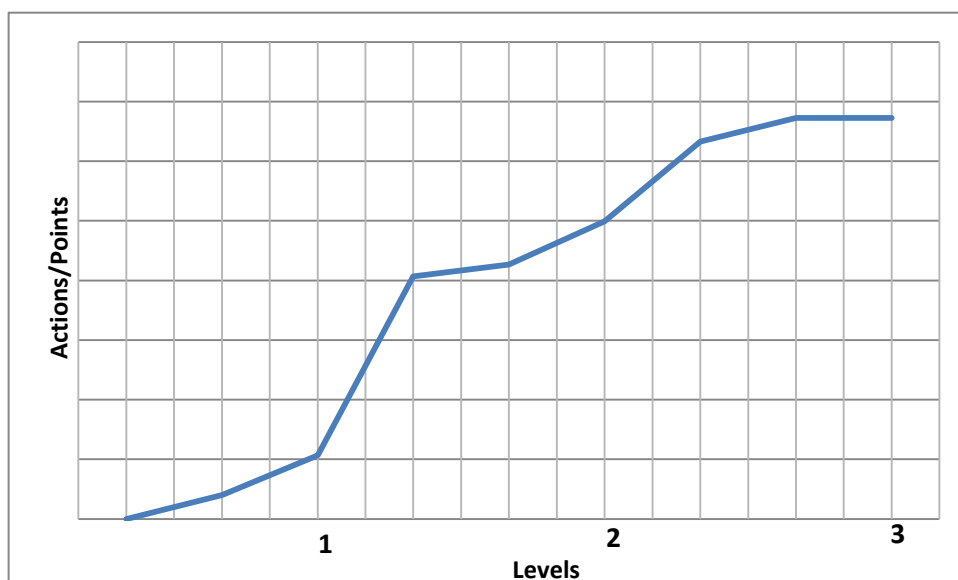
On the top left of the screen (see *infra*, Appendix 5), users can see their Green Points. These points are not redeemable and they increase every time a user makes a sustainable action. In order to get the points, users have to click the Project label and then decide the project they want to participate (see *infra*, Appendix 7).

4.1.5 Levels

Levels show the progress of the user and indicate where the player is in the game experience. The difficulty of the levels is not linear or exponential but it follows a curvilinear form. In order to prevent users from leaving the gamified system at the beginning of the experience, the first level is the easiest one and then it progresses toward a more complex one (Zichermann and Cunningham, 2011).

In Living Green, when a user starts a project, she starts from level one. At level one of every project there are three activities users have to perform. For example, at level one of the Foody project, users have to commit to “*eat fruits regularly*”, “*eat vegetables regularly*” and “*shop local fruit/vegetable*”. Users can decide which activity they want to perform within the level. In order to go through the level, users must complete all the activities. Once all the activities are completed, users have to take a final test (see *infra*, End Level) and only if they answer all the questions correctly, they will be able to pass to level two. When a user completes a level, she receives a badge.

Figure 2, Expected difficulty per level



The graph above shows how the difficulty of the levels increases in Living Green. At level one, the activities are quite simple and the corresponding points are correlated with the difficulty of the activities. From level two, the activities start to be more

engaging and therefore the Green Points have more value. At level three, there is a slowdown in the complexity of the activities users have to take.

For this research, three levels have been designed for every project. Since in every level there are three activities and there are seven projects, a total of sixty-three activities have been created for this research.

End level

Some games have at the end of the level a fight against a boss. The boss is usually more powerful than the others enemies or obstacles the player had met until that point (Boss, Wikipedia).

Green living has as well at the end of the level something similar. Users have to read an article about a selected topic, which is related to the actions they had taken in that level, and then they have to answer some questions in the form of a quiz with true and false answers within a limited period of time (in order to avoid they go on the internet to find the information).

For example, at the end of level two of the Foody project, there is an article about *Organic Food* (see infra, Appendix 13). Thus, first users have to read the article which provides valuable information about organic food. After that, users have to take a quiz about the learned topic. When users answer the questions, they are not able to see the article, so it is important that they had read the article attentively beforehand.

The quiz at the end of the level has been designed for two reasons. The first one is to raise awareness about a sustainable issue. Users will have to learn the topic because otherwise they will not be able to answer correctly the quiz and consequently to clear the level.

The second reason is to be sure that users do at least one thing in that level. As we have highlighted before, when users commit to do the activities within the level, it is just a commitment and it is not possible to check whether users have done the sustainable action or not. In introducing a quiz at the end of the level, we make sure that users read the article in order to answer correctly all the question of the quiz.

Badges

After having answered correctly at all the questions of the quiz, users receive the corresponding badge. It is possible to have a maximum of seven badges, one for each project. For example, if a user completes the first level of all the seven projects, she will own seven badges. At the moment that a user completes the second level of a project,

the badge she had received at the end of level one will be replaced by the badge of level two, which is more important.

Human beings have the desire to be recognised for achievements and badges are an ideal game mechanics to express it. In addition, badges mark also the status of a person. Some other people like just collecting items and for them collecting badges are a powerful drive (Zichermann, Cunningham, 2011).

According to Antin and Churchill (2011), badges have the following social psychological functions:

- Goal settings: they challenge users to meet specific goals. Goal settings are known to be powerful motivators
- Instruction: they serve as guidelines throughout the experience of the users
- Reputation: for some users is a way to show off what they have achieved and to demonstrate to other users what are their skills
- Status/affirmation: first badges can engage users because they are as status symbol. In addition, they are like trophies which shown past accomplishments
- Group identification: when more users have the same badge, they will feel part of a group

Another game mechanics which is quite powerful are leaderboards.

4.1.5.1 Leaderboards

Leaderboards are essentially a ranking system. Their goal is to make comparison between users (Zichermann, Cunningham, 2011). In some situation they can be a potent motivator because users know that they need a few points to go up in the ranking. However, for some other users they can have a negative effect. For example, when a user sees that is far behind the top players, it can reduce the enthusiasm to continue because she will never be able to reach that level (Werback, Hunter, 2012). For this reason, there are two ways to make the leaderboard interesting for all the users, even for the one who stands low in the ranking.

The first manner to design a good leaderboad is to place the user always in the middle of the ranking. No matter how many points she has, her position in the ranking will be always in the middle. In this way, a user will see only the other people who are very close in the ranking and she will perceive that it will not be too difficult to overcome

them (Zichermann, Cunningham, 2011). In Living Green users are always placed in the middle of the ranking.

Another important feature of good leaderboards is to slice them into various rankings. (Zichermann, Cunningham, 2011). In Living Green, users will be able to see themselves in four different ranking systems.

The first type is a ranking of the projects. Users are able to see which project is the one with more points compared to the others one. The second ranking scheme is the overall one. Users can see how they are performing against all the other users. Users will be also allowed to form groups and therefore there will also be the leaderboard for groups. Besides, the last ranking is also about a group, but this group is given by the membership users had already acquired. For example, Living Green has been designed for students and they have been split by their branch of study (i.e. in French: Filière). If this gamified system had to be implemented in a work environment, we would have had the teams where employees work or the departments.

4.2 Community

When designing a game or a gamified system it is essential to consider the social dimension. As mentioned above, most people play games to socialise (i.e. on average 80 % of us play games for the social dimension) and therefore it is important to integrate game mechanics with social interactions. If a game is designed only for winning, it will appeal only to a small part of the targeted audience (Zichermann and Cunningham, 2011). For this reason, in Living Green it is present a community. The *Community* is similar to the dashboard of the most popular social network in the world: Facebook. In the community, users can interact with other users and the topic of the dashboard is sustainability. Every time that a user interacts with the community, she is rewarded with coins.

4.2.1 Coins

Before it has been mentioned that in Living Green there are two points system. The first one that was presented was experience points (i.e. Green Points). In this section, it will be illustrated how it works the second point system: redeemable points.

Redeemable points in Green Living are known as Coins and users can receive them when they interact with the community. The objective of the coins is to increase the engagement of users in the community. By rewarding users with coins, the expectation is that they will use the community as much as possible.

In the following table it is possible to see how users can collect the Coins.

Table 1: Collection of coins

Activity	Coins
Comment news and picture	2
Vote news and picture	5
Post sustainable news	20
Share picture of a sustainable activity	30
Best news of the month	50
Best picture of the month	70
Invite a friend in Living Green	30

First off, users can post sustainable news. For example, they find interesting news about climate change and they share it with the other members of the community. In doing so, users receive 20 coins. In addition, if users do a sustainable activity, they can take a picture of themselves while they are doing it (e.g. recycling paper) and post it in the community. In this case, users will receive 30 coins. Doing a sustainable activity is more demanding than just reading and sharing an article and therefore it is worth more coins.

Other users of the community can then comment and vote the post that other users had shared. When users comment an article or a picture, they receive 2 coins while when they vote, they receive 5 coins. Voting other posts is considered more important than commenting because at the end of the month the best news and the best pictures will be rewarded with additional coins: 50 coins for the best news and 70 coins for the best picture. The best article and news will be elected according to the vote of the other users.

As in real life, coins will be kept by users in a wallet with specific characteristics (see *infra* for details, 4.2.2 Wallet).

One issue that might arise in the community is that users will post any type of news or pictures neglecting the sustainable dimension. One solution to this potential issue is the voting system. The fact that other users vote the best sustainable activity, it should prevent other users from posting any type of news or pictures because they are motivated by the possibility of winning the prize at the end of the month. Of course, this might not be enough and therefore another control system should be developed. A solution could be that the manager of the platform will control the content of the posts and will filter them. At this stage of the design of the gamified system, a control system has not been developed.

4.2.2 Wallet

In Green Living there are four different types of wallets. They differentiate on the amount of coins users own. In the following table, it is explained the features of the different wallets.

Table 2: Wallet Colour

Colour	Coins
Beige	0-199
Brown	200-499
Blue	500-1499
Black	From 1500

For example, when users own 50 coins, they will have the beige wallet. As soon as a user has more than 199 coins, she will have a brown wallet. The wallet which contains more coins is the black one which users will have from 1500 coins.

It is important to point out that when one user will check the profile of another user, the former will not be able to see the amount the other user owns. The only detail she will notice will be the colour of the wallet. Thus, users will be able to have just an idea of the amount other users have because they will know the rules explained in Table 2.

In this case the wallet is used as a level and as a badge at the same time. First, users will know that to go through the “first level”, they will have to get at least 200 coins.

Secondly, it will be like the credit card system. When we apply for a credit card, we have to decide the monthly limit for our credit card. Companies that issue credit cards they all offer several credit cards with different colours. To every limit is associated a credit card with a specific colour. So for example, when a client has a limit of 5,000 CHF per month, she will have the white credit card. If a client has a higher limit, for instance more than 10,000 CHF per month, the colour of the credit card will be gold and when it is higher than 20,000 CHF per month, the colour will be platinum or black. In addition to the limit, the more important the card is, the more privilege a customer has. Thus, when a client owns a credit card with a higher limit, other people do not know how much she has in the bank account, but they can guess that this person has had financial success and a credit card with a high limit could be perceived as a status symbol.

In the following section it will be explained how users can use the coins in Living Green.

4.2.3 Use of coins

Users will be able to use the coins in the following ways:

- Customise their badges
- Buy and offer virtual gifts to the other members of the community
- Convert them into physical goods
- Donate the coins
- Use them as a token to play at Green Trivia

The first four possibilities of using the coins will be explained in the following section. Regarding the use of the coins as a token, it will be explained later in the Green Trivia chapter (see *infra*, 4.4 Green Trivia).

Badges customisation

According to Zichermann and Cunningham (2011), customisation is a potent instrument that stimulates engagement and commitment. Therefore, offering a choice for customisation is important in a gamified system.

In Living Green, users will have the opportunity to use their coins to customise the colour of their badges. The choice will be limited because, as suggests Barry Schwartz (2004), when people have more choices, their satisfaction increases proportionately. Nonetheless, when there are too many alternatives, their satisfaction decreases dramatically.

Badge customisation is a simple option, but it might appeal to some users and could increase their engagement.

Virtual gifts

In virtual games, “Gifts” serve as a way to socialize with others (Zichermann and Cunningham, 2011). In this gamified system, gifts are used in combination with other mechanics: “Flirtation and Romance”.

According to Zichermann and Cunningham (2011), *Flirtation and Romance* are not intended as in real life as a way to express sexual interest, but they are usually used to start small talk with other users. Example of *Flirtation and Romance* are poking, smiling, etc.

In Living Green, users can buy and offer virtual items (i.e. smiles, poke, etc.) to other users. Thus, virtual gifts are intended to increase the social experience in Living Green.

Physical prizes

Another way to use coins is to convert them into physical goods.

Literature suggests that there might be some issues in using extrinsic rewards to engage people doing things. Indeed, the risk with external and tangible rewards is that at the beginning they are powerful motivator, but then after a while they become ineffective (Werback and Hunter, 2012). Nevertheless, for Living Green the external reward would be just a little part of the gamified experience and some gamified system have already proved to be effective with external rewards (see *supra*, 2.2 Gamification Case Studies, Frequent Flyer Program).

In Living Green, users will be able to exchange their coins with some real prize: for example, for 100 coins they will be able to get a free healthy meal, for 500 coins they will receive a Hoody and for 2,000 coins they will be offered a sport week end.

The question that might arise now is how the owner of the platform will be able to finance the gifts. If for virtual gifts there are essentially no costs, for real and material one there would be a relevant expenditure. The author of this research has decided not to address this question because at this stage of the study, it is important to check whether some elements of the gamified system could appeal to potential users or not. Therefore, the financial aspects have not been considered yet. If this research will provide valuable and positive findings, another study will be proposed with some alternatives on how the gifts will be funded.

Donate the coins

Users will be able to donate their coins in two ways: first, they will be able to donate coins to other users. The goal of this option is to increase the social experience for some users. They might be interested in using the community despite the fact of being rewarded with coins. Indeed, they might be attracted just to the social experience and therefore they might find the coins useless. For this reason, to increase their social interactivity with other users, they might decide to donate their coins to other members of the community. Furthermore, they might donate their coins because they want to award other users for their sustainable involvement and commitment.

Another way to donate the coins will be to give them to an organisation that will be in charge of planting trees: for 50 coins it will be possible to plant a tree. Some users

could be really into sustainability and therefore they might be interested in using the coins for the good of the environment. In this case, as for the physical prize, there might be the financial dimension to consider and an additional research might be needed to find the best way to finance the plantation of trees.

4.3 Hearts

The final objective of Living Green is that users change their behaviour by doing the activities in the projects. However, some users might prefer to spend their time by just using the community and they will go in the project section rarely or never. Firstly, they might stay in the community just because they prefer to interact with other users and use it as a social network. Secondly, some other users might be interested in just gaining as many coins as possible.

In order to avoid that users stay only in the community and never participate to projects, it has been created a system to oblige users to go in the project section from time to time.

The principle is very simple: if users want to interact with the community they need *Hearts*. The only way to gain hearts is to do an action in the projects section. Therefore, every time that a user does an action, she will receive a heart. The maximum number of hearts users can receive is five. When a user reaches five hearts, she will be able to continue in the projects experience and she will still increase the amount of *Green Points*; the only item that will be capped is the amount of hearts.

At any time that users do any action in the community (e.g. post news or a picture, comment or vote), they will earn some coins but at the same time they will lose one heart. When user will not have any more hearts left, they will have to go back in the projects section and start again doing sustainable actions. Let's make an example to clarify it.

Let's assume that a user go in the projects section and do three sustainable activities. At this point, she will own three hearts. Then, this user goes in the community and votes about a news that another member had shared and then she comments on two others posts. In this case, she will have received the coins for commenting and voting but she will have lost the three hearts (i.e. one for voting and other two for the two comments) and therefore she will not be any more able to interact with the community. If the user tries to comment, vote or post anything, the system will tell her that she is not allowed because she does not own any hearts. Therefore, the user will have to go back in projects section and start again doing sustainable activities.

Risk with the hearts

As mentioned, the use of the hearts in Green Living has been designed to avoid users staying only in the community. However, some users could find this mechanism not appropriate and could cause a loss of interest in the gamified system.

First of all, as declared above, most of the users are interested in the social dimension of the experience. Some users might find the fact of going back in the project section, in order to be able to communicate with the community, too complicated and they could leave the gamified system.

Secondly, the risk of using the hearts is that users will not feel the sense of autonomy in the game experience and the fact of “being obliged to do something” might create a sense of frustration which could cause a loss of users.

The author of this research is aware of the above two risks. However, the gamified system has been designed to foster a sustainable behaviour and the participation at the project is an essential part of it. Nevertheless, it will important to bear in mind these risks and see the reaction of users in the test phase.

4.4 Green Trivia

Another mechanic that is important to offer in a game are challenges (Zichermann and Cunningham, 2011). Challenges are ideals for killers and achievers-oriented players. Challenges give the opportunities to these type of users to win against the others and therefore to satisfy their need of being competitive.

In Green Living, there is the possibility to participate at a trivia where users have to answers seven questions. Before taking the quiz, they have the option to choose to play alone (i.e. “against the system”) or against another member of the community.

Users will have limited time to answer the questions. This has been implemented in order to avoid users surfing on the internet and finding the answers at the questions in an improper way. Questions will be the same that users will have already found at the end of the level (see supra, End Level). Thus, users will have already faced the same questions and they should already know the answers at those questions.

As already stated, users will have to answer to seven questions. This number has not been decided by chance, but they correspond to the number of projects. Therefore every question in the quiz will correspond to one question that users will have answered at the end of each project.

So for example, when users will have completed level one of every project, they should be able to answer correctly the questions asked in the Green Trivia for level one.

4.4.1 Against the system

Before taking the quiz “against the system”, users will have to decide how many coins they want to bet. After having decided, they will start to answer the questions.

If users do not answer correctly to all the questions, they will lose all the coins bet. On the contrary, when users answer accurately at all the questions, they will win an amount of coins which will be decided by a slot machine. Users will be sure that they will win some coins, but the amount that they will win, it will be chosen at random by the slot machine. The amount bet by the users at the beginning of the quiz will be multiplied randomly by a factor that ranges from 1.2 to 5 which will be communicated by the slot machine. So if a user bet 10 coins, and the slot machine give a factor of 1.2, she will win 12 coins. At the same time, the slot machine could give a factor of 3 and the user will win 30 coins.

According to Zichermann and Cunningham (2011), surprise and unexpected delights should be used in a gamified system as they contribute to increase the engagement of users. Slot machines are a way to make the effect of the winning unexpected. Unlike usual slot machine where users “win and lose”, in the one used for the Green Trivia, users will always win. The only unexpected outcome will be the factor that will multiply the amount that users had bet at the beginning.

4.4.2 Against another user

The second option will be to play against another user of the community. As for the first option, users will choose the amount of coins they want to bet. The amount will be the same for both the users: one user will propose an amount and the other one will have to confirm it.

In this situation, it will be not so important to answer exactly at all the questions but the goal will be to answer correctly more questions than the opponent. The user, who will beat the other user, will win the amount initially bet multiplied by a factor of 1.5. Thus, if the two users decide to bet 20 coins, the one that will win, will get 30 coins (20 coins times 1.5).

In this way the system will always win because one fourth of the coins bet will always be kept (in the example above 10 coins will be kept by the system out of the 40 used by the 2 players).

5. Paper Prototype and Usability Test

As mentioned in the methodology chapter, it has been requested to some potential users to test the gamified system. The test of the model for each user has lasted between 60 and 90 minutes (included the questionnaire and the interview) and it has been divided in ten phases. This has been done in order to facilitate the test and to check different game mechanics of Living Green. In Appendix 4, it is possible to see how the test was introduced to the user.

In Table 3, it is explained what were the objectives of the single phases and in the corresponding Appendix there are the details on how the test was conducted. For example, in Appendix 6 and 7 it is possible to see how the phase “Project” was carried out. In the first column of the table in Appendix 6, it is written what the “facilitator” had to tell to the user, while on the column in the right there are the details on how the “computer” had to move the pieces of paper according to the button that the user had touched.

Most of the model has been hand-sketched; nonetheless some parts have been created on a computer and printed. This alternative has been used when there was a lot of writing. As a matter of fact, the hand-writing of the designer of the gamified system is not very clear to understand and it was important that users could understand what was written on the paper. Therefore, a computer-printed version was the best option. In Figure 3, it is possible to see an example: as we can notice most of the prototype is hand-sketched, however in the middle (bottom) of the screen there is a part that has been created on computer and printed.

Figure 3, Hand-sketched combined with printed version



In addition, some parts were too long to be written and it would have been too difficult to integrate them in the main screen of the paper prototype. It is possible to find an example in Appendix 10.2: Prototype-Community.

Table 3: Ten phases of the usability test

Phase	Element Tested	Objectives	Appendix
1	Projects	<ul style="list-style-type: none"> - Show the different Projects to users - Show that for every sustainable activities users can collect Green Points - Show that for every sustainable activities users receive one Heart - Show that users can receive a maximum of five hearts 	Appendix 6 Appendix 7
2	Community 1	<ul style="list-style-type: none"> - Show the community and how users can comment and vote other posts and the corresponding coins - Show that for every comment/vote user lose one heart - Show that for every sustainable activities users receive hearts - Show to users that when there are not any hearts left, they have to go back to the project section (in order to collect hearts), if they want to continue interacting with the community 	Appendix 8 Appendix 10
3	Community 2	<ul style="list-style-type: none"> - Show to users how to post news or pictures and the corresponding coins - Show that for every post user lose one heart - Explain best news and picture of the months and the corresponding coins. 	Appendix 9 Appendix 10
4	Wallet	<ul style="list-style-type: none"> - Show to users how to post news or pictures and the corresponding coins - Show that for every post user lose one heart - Show the wallet colours and the corresponding coins 	Appendix 11
5	End level	<ul style="list-style-type: none"> - Show that amount of points increase when levels go up - Show quiz at the end of the level - Show that when a user ends a level, she receives the corresponding badge 	Appendix 12 Appendix 13

6	Green Trivia 1	<ul style="list-style-type: none"> - Show quiz against the system - Show that all the answers must be correct to win - Show that users bet the coins and what they win is decided by a “slot machine system” (factor between 1.2 and 5) 	Appendix 14 Appendix 16
7	Green Trivia 2	<ul style="list-style-type: none"> - Show quiz against another member of the community - Show that user need to answer more questions correctly than the opponent in order to win (the user that win: number of coin bet * 1.5) - Show that the two users need to agree on the amount that they bet at the beginning 	Appendix 15 Appendix 16
8	Use coins	<ul style="list-style-type: none"> - Show to the user how coins can be used 	Appendix 17
9	Achievements	<ul style="list-style-type: none"> - Show how user can see her badges - Show how users can check the profile of other users 	Appendix 18 Appendix 19
10	Leaderboards	<ul style="list-style-type: none"> - Show users the ranking and how does their position in the ranking moves when they collect additional Green Points 	Appendix 20

6. Results

In this chapter, the results of the usability test with the paper prototype will be presented. Results are based on the interviews conducted after the test. All the interviews were recorded – with the approval of the interviewees – and transcribed. All the transcripts are available on Appendix 22.

The results are explained with a general-to-specific order. First, there will be the general opinion about the gamified system and the experience itself with the paper prototype and then it will be explained the results about the game mechanics into details.

Furthermore, I also added a short analysis of the individual answers of the users in order to understand whether there is a correlation between the profile of the users and their answers during the interviews.

6.1 General impression about the tool

The majority of the respondents found Living Green interesting and simple to use. Some of them answered that it is a good way to inform people about sustainability issues. However, two users did not completely understand the logic behind it.

Another aspect that I checked was the paper prototype experience. I have checked this dimension for two reasons:

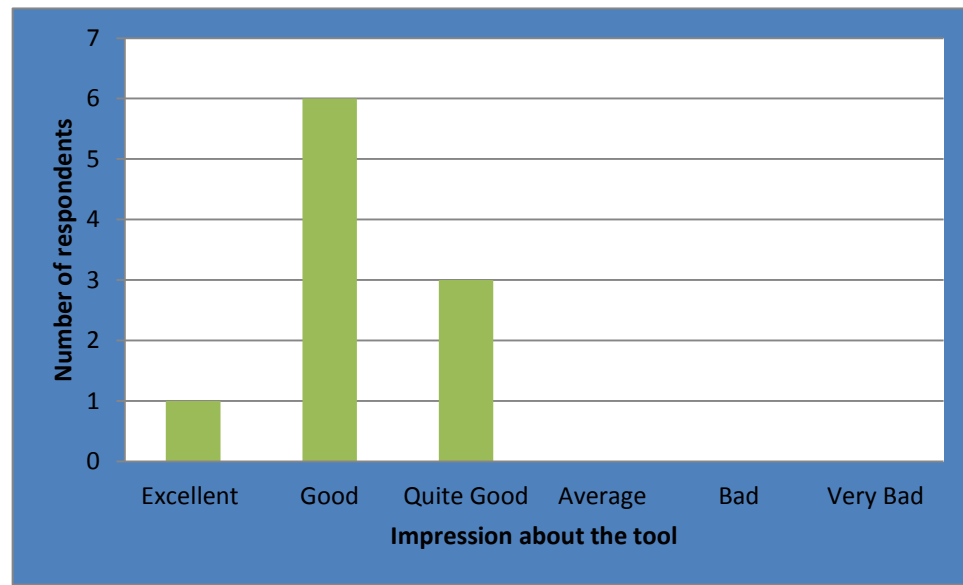
- First, I wanted to check if the paper prototype was realistic. Since it was my first time that I was working with it and I have never used this technique – even as a user-, I was curious to know if it really gives the impression to users of a real interface.
- Secondly, for the interest of the study it was important that the experience of the paper prototype was real. If it was not the case or if something was not clear, the answers of the users could be biased by the fact that they could not understand completely how Living Green was working. Indeed, if the paper prototype was not good, their answers could be distorted by the negative experience of the paper prototype.

All the users found the experience with the paper prototype good and most of them found it realistic. They did agree that it was not exactly as one in a conventional screen of a computer because it was slower. However, they said that after they got used to it, it was as a real one and the interaction was good.

When I asked users how the general impression about the tool was, they all answer that it was between “quite good” and “excellent”. Six out of ten people answered that it was good.

Certainly, these data are not statistically significant, but with the feedback that users gave during the interview and the grade, it can be seen as a positive result.

Figure 4, Overall impression about the tool



6.2 User friendliness of the tool

All the users agreed that even if the gamified system was not on a computer, it was simple to use. Most of them stated that even without the explanation of the facilitator, it would have been easy to use. Perhaps at the beginning, it was not everything clear, but after using it for a few times, it became very clear. In addition, they said that the interactivity was good. Two of the respondents also said that the main screen was well designed, that everything was at the right place and that the icon to touch or click were not so many but they were just enough.

However, there was more than one user that affirmed that the mechanism of how the hearts were working was not very clear at the beginning. However after using Green Living for a while, it became clear.

Another criticism was about the misleading meaning assigned to hearts symbol: in videogames language hearts are usually used for counting “lives” that user has available in the game. Therefore, the image of the heart is probably not the best choice because it is not correct that when a user interacts with the community, she loses one

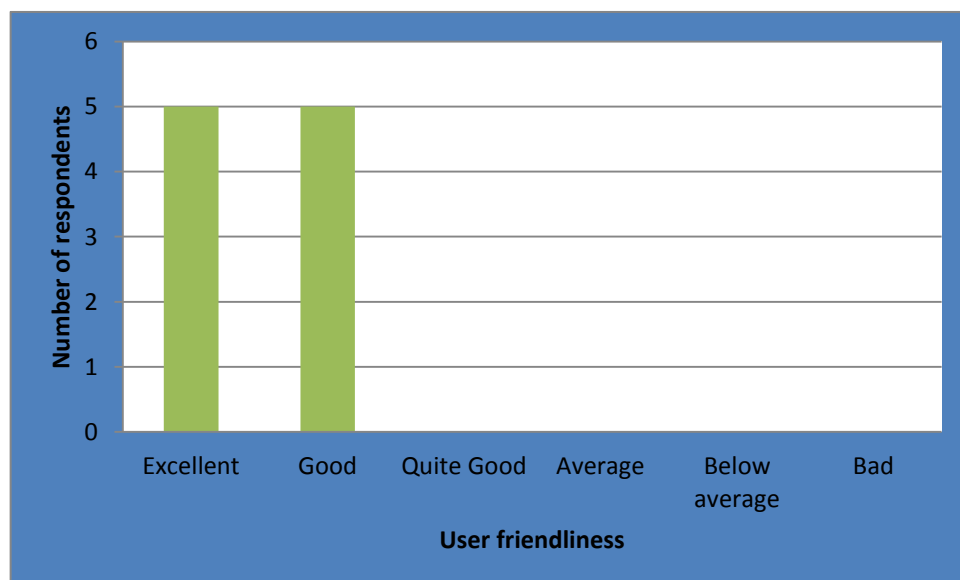
“life”. They had the impression that they were penalised for interacting with other members of the community.

A user suggested that it would be a good idea if there was an explanation on how the points, the coins and the hearts were working. For example, by moving the mouse cursor on the icon of the points, a pop-up window with the explanation should appear.

Finally, a user advises that all the badges, maybe of smaller size, should appear on the main screen.

In rating the user friendliness of the tool, the rating was satisfying: five users defined it “excellent” and the other half graded it “good”.

Figure 5, User friendliness of the tool



6.3 Effectiveness of the tool

Most of the respondents affirmed that the gamified system used during the usability test would help them somehow to do more sustainable activities. The majority said that they would not do probably all the activities proposed in the projects but they will do only some of them. They see it more as an advisor that could give them valuable tips about sustainability.

In addition, two users stated that it is important the type of activities they are requested to do. They need to be interesting, new and users need to see the added value. Furthermore, they need to be adapted to their personal situation. Some people already do some actions; therefore some activities in the projects are useless. In addition,

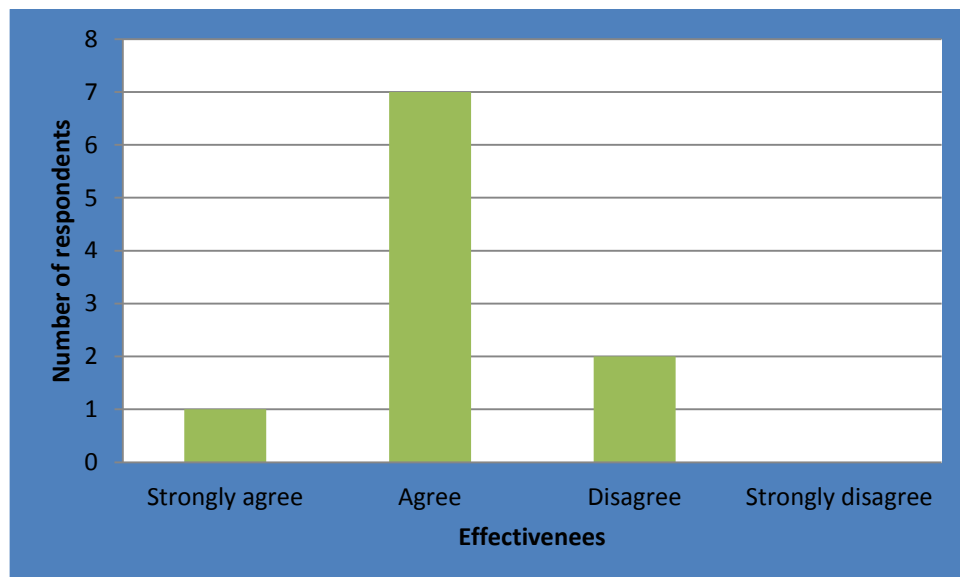
depending where the users live, the context is different and consequently it might be more interesting to focus on some activities rather than some others.

For some users the gamified system would be effective only when used by people that already believe that sustainability is important and they care about it.

Finally some users explained that for them the community will play an important role: if they see interesting activities in the community, they will probably do them in their daily life.

As we notice in the following graph, only two users found Living Green ineffective. The others respondents think that the gamified system would help them in doing more sustainable actions.

Figure 6, Effectiveness of the tool



All the respondents agree that it might be a risk that it is not possible to check whether a user does or not the activities in the projects. Some users might be interested just in earning the hearts to interact with the community. Some others might be interested in getting the hearts, so they will be able to get as many coins as possible. In this case, the risk is not only that users will not do the sustainability activities, but also that it might cost a lot in terms of money to the administrator of the gamified system. If there were no physical rewards, this will be not an issue, but because users can exchange the coins with real rewards, it might be very expensive for the owner of Living Green.

Even if it would be better to check if a user do the activities, some of the respondents estimates that it will not be a big problem because people, who will register in this gamified system, will be interested in sustainability and therefore they will not cheat.

Respondents have as well proposed some solutions to control that users do the activities. For example, one user could certify that another user had done the sustainable activity. Another way would be to use the new technology. For instance, there should be a QR code on the plastic bottle and when user go and recycle it, she will scan the bottle with the smart phone and the information will be communicated to Living Green. Another one proposed to focus the attention on the quality of the information given and the way that are shown. The information should touch emotionally the user and in this way users will do the actions because they really understand what is at stake.

6.4 Use of the tool

The answers at this question were very variegated. A common denominator was the time that potential users will use the gamified system. Most of them affirmed that they will try it and they will use for a short period of time but they are not sure that they will use in the long run.

Another interesting point was that when it was asked if the interviewee could use it in reality, the answer was positive. However, when asked if other students in the school would use it, the answer was that only a minority of the other students would use it and more specifically the one that are really into sustainability.

Some other respondents pointed out that the students that are not interested in sustainability would use it only for the final rewards. Therefore, the reward is essential for the use of Living Green.

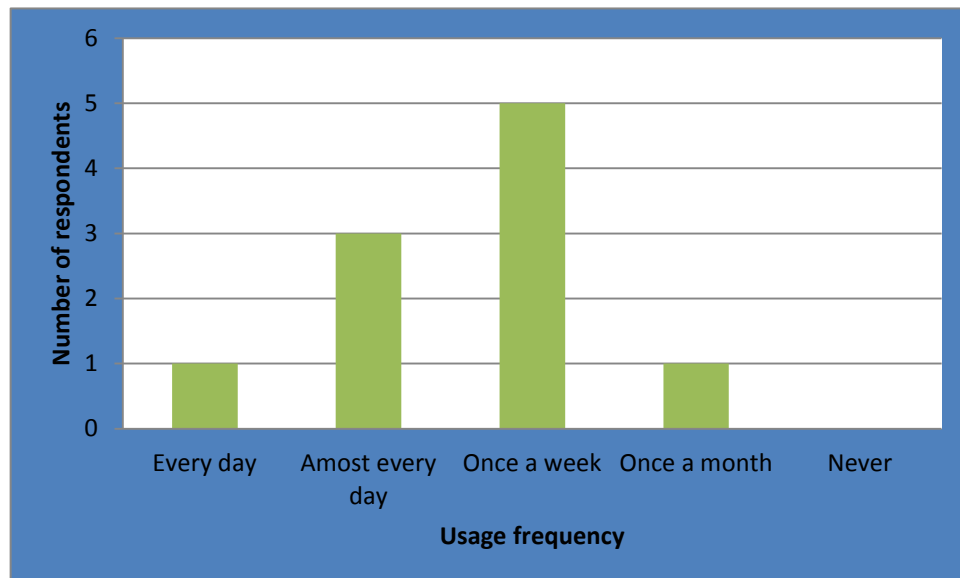
As mentioned above the answers were very different, thus it is difficult to draw interesting conclusion. Further studies in this sense should be conducted. However, I personally found the answer of an interviewee very interesting: he is a young father and he thinks that this tool would be perfect for younger people. He suggested students between ten and twenty years old. He claimed that for him this is the perfect time to learn about sustainability and this generation is suitable to use gamification technique.

Moreover, it is worth mentioning an opinion of another respondent. He thinks that a way to increase the usage rate of the gamified system would be to design it in a complete different way. In using an interface like Farmville, it could have more success.

For example, at the beginning the city will be polluted but then, as the user behave in a more sustainable way in real life, the city will become cleaner.

When asked to students the frequency that they would use an application like Living Green in reality, half of them answered one time per week. Four students answered that they would use it almost every day or every day.

Figure 7, Use of the tool



When asking if it will be good to implement a similar tool in a work environment, most of the respondents answered that it should be adapted in several ways: first to the type of work, then the prizes, which will play an important role to engage employees, and finally the interface should have less game elements.

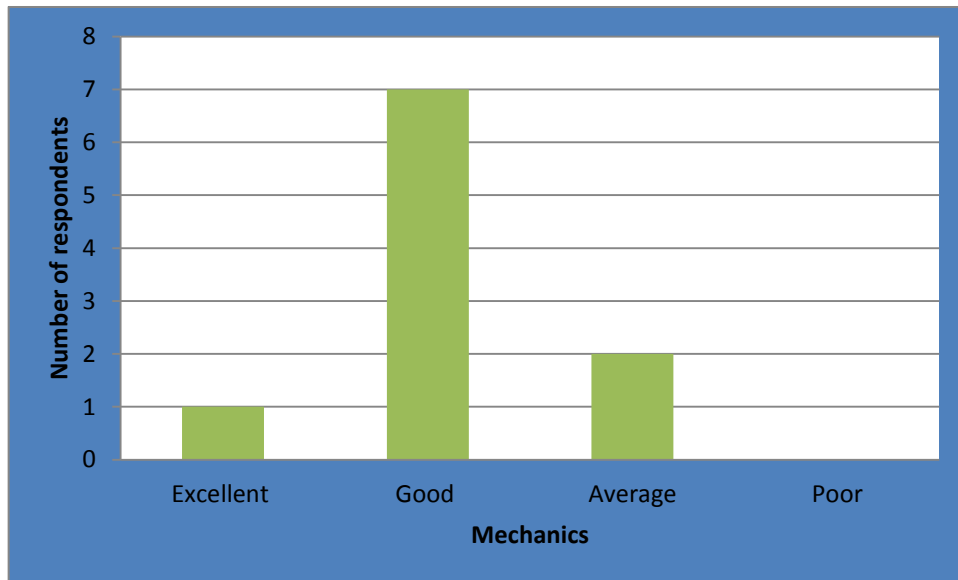
6.5 Game mechanics

In this section, I will present just the most important results. I will not explain all the game mechanics that has been discussed with the users. They will be presented the one that need to be modified and the one that are more interesting.

Before going into details, it will be shown how the respondents graded the game mechanics. It was asked to users to give an average grade on the mechanics that were presented during the usability test.

The majority of the respondents affirm that the game mechanics as a whole are good. As we can see in the following graph, one interviewee said that the game mechanics are excellent, seven respondents defined them good and only two stated that they were "average".

Figure 8, Game mechanics



Projects

Users will participate at the projects if they see the added value of their actions. The activities proposed must be interesting and not something that users already know or do in their daily life.

Most of the users think that there should be a control on the activities and they should be compulsory. The risk is that some users will just tick the box without doing in reality the sustainable activity (i.e. in order to commit to do the activity, users had to tick a box, see infra Appendix 7). They believe that other users might behave in this way for two reasons: first because they want the hearts only to interact with the community. Secondly, some users might be interested just in collecting coins for exchanging it with the final rewards.

Real rewards

Most of the users affirm that the real and physical rewards are important for the use of the tool. They think that they are fundamental for the success of the gamified system. Without them, they would probably not use the tool.

Other users – the minority - said that they would use the tool even without the physical prizes. However, they claimed that they would exchange coins with physical prizes if there is the possibility in the gamified system.

Use of the coins

Most of the possibilities offered to use the coins were appreciated. The one that probably will not be used by users will be “donate coins to another user”. The most preferred, in addition to the physical reward, was the donation of coins to plant a tree.

Wallet

Many users like that the colours of the wallet change depending on the amount of coins there are inside. The only thing that they would change is the type of colours that have been chosen for the wallet. They would use more sustainable colour and for example for the most important wallet they would use the green.

As for the fact of hiding the content of the wallet to other users, it did not appeal to many respondents. For many of them, there is no difference whether they see the content of the others wallets or not and hiding the coins do not provoke any particular reaction to them.

Hearts

The majority of the respondents understood why the mechanism of the hearts was implemented. However, there were some critics about it. First, hearts are usually perceived by the gamer community as “lives” and therefore it could be misunderstood. It would be better to use another image instead of the hearts.

Moreover, some users answered that they did not like that when they wanted to vote or comment or post something in the community they had to go back in the projects in order to get more hearts. They want to interact with the community freely, without limitations. They would go back in the projects field just to earn some hearts but they would not do in reality the projects. Also for this reason, they found the use of the hearts useless. Indeed, they could not understand what was the point of asking to go back in the project field when there is not a control on it and the projects are not compulsory. As a result, these potential users would probably not use the gamified system in the long term.

Finally, a user pointed out that it is not correct to penalise users who participate in the community. Indeed, users in the community are as well promoting sustainability – by informing, discussing, etc. - and therefore is not correct to punish them.

Green Trivia

Many users liked the Green Trivia. They also found the slot machine at the end interesting. The only negative point about it was that perhaps it is too difficult to answer all the questions correctly in order to win the prize.

Collection of Coins

During the interviews some users have done an important remark: *“how are you going to control that the news or the pictures posted in the community are relevant and are related to sustainability?”* In addition, they said that the fact that other users can vote for the best post of the month is not enough as a deterrent. For them, there will still be some users that will post any type of comments in the community just to receive some coins.

One interviewee suggested a solution that could be interesting. If users are penalised when they post useless information in the community, they will probably stop posting any type of information. For this respondent, it should be implemented a “bonus-malus” system, where users that post interesting information are rewarded and when they post just useless information, they will be punished.

6.6 Individual results

This part is not at the core of the research but it is interesting to compare the profile of the respondents with the answers given after the usability test. It could enable me to see if the gamified system is designed for all the type of “players” (see supra, 2.4.3 Types of players.). Even if the sample has been chosen at random, there are some possibilities that all the type of players tested the model. If it is the case, this will make me understand whether the game mechanism used for building the gamified system have been chosen correctly.

The analysis of the individual profile has not been conducted in depth but I have just highlighted some interesting points.

User 1, 3, 5 and 9 have all a profile “Win-Achieve” oriented. During the interview they stated that they like the “colour of the wallet”, the “Green Trivia”, the “leaderboard” and the “level with the associated badges”. The interviews confirmed that they like competition (i.e. Green Trivia) like the killer (“Win”). In addition, like the achiever (“Achieve”), they are interested at their reputation (i.e. show badges, leaderboards and the colour of the wallet).

User 6 is the only user that affirmed in her profile that she is “not a gamer at all” and that she is not “interested in game”. This was confirmed also during the interview about Living Green because she did not show any interest in the game mechanics proposed. On the other hand, this user has a “Collaborate-Explore” profile and when she uses social networks, her main activities are sharing personal and public information. Thus, in social network, she is very engaged in interacting with the others. During the interview this aspect of the user was confirmed because she did not like the hearts at all. She found this element useless because she wanted to communicate with the “Community” without limitation. The limitation of the hearts was also observed with User 10, who also has a “Collaborate-Explore” oriented profile. For both user 6 and 10, their motivation of behaving in a sustainable way depends on the other and putting a limitation like the hearts will not help them to have a sustainable lifestyle. As a matter of fact, it will have a negative effect and it will lead these users to leave the gamified system.

The last point that I want to show is linked to a user that likes to play game. According to the profile of User 7, she plays games on mobile phone every day. She usually plays games alone and not against or with other people. In addition, her profile tells us that sharing information (personal or public) is not the main activity when she uses social networks. During the interview this user affirmed that she did not like that in order to advance in the game – to get more coins - she has to post in the community. Therefore, it should also be offered an alternative way to earn coins for user with this type of profile.

7. Analysis of the Results

In general, Living Green is a good tool to inform people about sustainability. It is simple to use and is user-friendly. The paper prototype experience was satisfying and users found the interaction good. Moreover, the prototype did not prevent users from understanding the functioning of the gamified system.

One subject that has caused many reactions is the activities in the projects. Most of the users think that it might be risky that the activities are not compulsory. Additionally, they had serious doubt about an honest self-reporting. When I designed the tool I was aware of this potential risk. However, after having seen the results of Practically Green (see *supra*, 4.1.1. Assumptions about the Actions), I decided to opt for this solution. At the moment, I still do not have an alternative to propose, but it is sure that something has to be changed. Indeed, some users could abuse of this system: they might use the gamified system just to earn coins which then can be turned into real rewards which consequently will have an expensive cost for the owner of the gamified system.

Another aspect related to the activities which need to be improved is the quality. Only if the information provided is useful, new and bring an added value, they will be performed by the users. This is not something difficult to change. I am not a specialist in sustainability but I think that in doing a bit more of research and consulting some sustainable specialists, it will be easy to create the appropriate activities.

In addition, the activities should be adapted in a certain way to the specific situation of the user. A possible solution could be to ask users to complete a form before starting using the gamified system. However, this solution must be implemented in a way that will not have negative consequences on the onboarding process. Onboarding is the action of bringing a new user in the gamified system (Zichermann and Cunningham, 2011). It will be too risky to ask users, even before starting using the tool, to provide personal information. According to Zichermann and Cunningham (2011), this would be a major mistake because users will not give personal information to somebody they do not know. Furthermore, at the beginning it is important that users understand what the system is about. Thus, a possible solution could be that at the beginning user will experience Living Green, and then on a second stage – after one week or two - it will be asked them to provide personal information. In order to make users share personal information, it will be proposed to reward them with coins. Moreover, it will be shown what will be the advantages for them – in terms of activities - if they provide the requested information.

Another factor that needs to be analysed is the target of the gamified system. Many users affirmed that the gamified system will be effective mainly for people who have already “strong sustainable value”. If on the one hand this is a positive answer, because the gamified system has been designed for people who believe that sustainability is important but they have some issues in behaving in a sustainable way (i.e. Consumers: gap between attitude and behaviour, see supra, 1.2. Global Challenges and Trends), on the other hand it means that it would not motivate the other people - the one who do not have a sustainable attitude – to have a sustainable behaviour. I personally was hoping that the gamified system would have stimulated also people who are less inclined to behave in a sustainable way, but unfortunately it is not the case according to this research.

Another interesting result was that when it was asked to respondents if they could use the gamified system in reality at school, the answer was positive. However, when asked if other students in the school would use it, the answer was that only a minority of the other students would use it. This answer is quite contradictory because most of the respondents affirm that they would use it, but then when the question is related to other students the answer is the opposite. If the sample had been chosen because I knew that the people of the sample had a strong sustainable attitude, I could have believed that their answer was true. Because I know that it is not the case – the sample was chosen at random and the probability of having in the sample only people with strong sustainable value is very low – it makes me suppose that the respondents might not use the gamified system if implemented in their school. An additional study should be conducted to better understand this aspect.

Respondents also answered that they would try the gamified system for a short period of time, but then they are not sure whether they would use it in the long term. This could mean that either the gamified system is not very well designed or that something is missing. A further study should be conducted in order to understand this answer.

A good input received by a user was that the target of the gamified system should be youth between ten and twenty years old. This alternative should be taken into consideration really seriously. As we have seen above (see supra, 1.2. Global Challenges and Trends), younger generation have grown up with mobile phones, video games, social networks and therefore they might be an interesting target for this type of gamified system.

Another user suggested that the gamified system should be designed in a different way (e.g. like Farmville). I had thought about this option when I was designing the model,

but with my little experience in gamification and in paper prototype I preferred an easier design.

Even if literature suggests that physical rewards are not effective in the long term, most of the users found them an important element of the gamified system. I am aware that it could be a risk in using them, but the answer of the respondents were very clear in this sense.

The information shared in the community will need a control in order to avoid abuse. The community has been created to share just sustainable information and for this reason it will be important to find a way to regulate it. I personally like the suggestion of a user that said that a “bonus-malus system” could stimulate users to post only sustainable information.

Finally, the hearts system has to be eliminated or modified. Especially users that have a “socialiser” profile did not like them. If we consider that literature suggests that 80 % of the gamer have this type of personality (see supra, 2.4.3. Types of players), it will not be an appropriate choice to keep the hearts. In addition, the hearts are also against the Self-Determination Theory (see supra, 2.4.1 Self-Determination Theory). First, users do not feel the power to determine their own behaviour (i.e. “autonomy”) because they cannot interact with the community when they desire. As a consequence, this is also against another need of the Self-Determination Theory: relatedness. The fact of not having the hearts will limit this need. However, I still think that a system to stimulate users to do sustainable actions in the project is needed. A possible solution will be to increase the number of points or rewarding them with coins for participating in the project. An additional study to check these options should be conducted.

7.1 Recommendations

According to the results of this research, even if not statistically significant, a gamified system could help people in behaving in a more sustainable way. This research is just an exploratory study but it has allowed to interesting results. There are still many open questions and additional researches should be conducted.

Living Green was a tool used to show to potential users what a gamified system is. In the future, other gamified system with other game mechanics or other interfaces could be implemented. For example, it could be interesting to conduct a comparison study with different gamified systems and check which one is the best.

The target chosen were students of a university but in my opinion also other targets are suitable for this research. It would be interesting to conduct the study in other situations. The first one is in a work environment and the gamified system will try to motivate employees in having a sustainable behaviour. The second one is about customers: it could be created a loyalty program for clients who are engaged in sustainability. In both situation, the gamified system should be adapted at the type of business and senior managers should define the main objectives. For example, a company that uses a lot of energy and would like to consume less, it will have a gamified system that will engage employees to save energy.

The sustainable gamified system would mainly motivate people that are already interested in sustainability. Other people – who are less interested in sustainability - could probably try it, but the results of this research have showed that they would not use it in the long term. This type of segment will be motivated to use the gamified system only if a real reward is present.

Notwithstanding the gamified system proposed and the target of the gamified system, using game elements in non-game contexts is a good system to engage people in behaving in a sustainable manner.

8. Conclusion

As showed at the beginning of this research, our ecosystem is under pressure and in the future it will be even worse because of the increase of the world population. Everybody is aware of it and many important actors are trying to find solutions in this sense. The proposed solution (i.e. gamified system) does not have the goal to solve the whole issue but it is just a drop in the ocean. However, if everybody thinks that the single efforts are not important, we will not be able to find a solution. It is only if everybody goes in the same direction that we will be able to cope with the challenge of the future. The gamified system proposed in this study is exactly this: it attempts to motivate every single individual to have a sustainable lifestyle. Consumers are becoming more aware of the sustainable and the environmental issue and therefore companies should propose them some tools which motivate them in behaving in a more sustainable way.

What I have tried to do, it is to motivate students to behave in a more sustainable way in their daily life by using a gamified system. Even if it is an exploratory study and it is not statistically significant, results are interesting.

The sample questioned agreed that it could be an effective way to motivate students to do more sustainable actions. They think that the gamified system will be mainly used by students who already have sustainable values. However, it could be used also by the other students, but only if there are interesting external rewards such as prizes.

The specific results on the proposed game mechanics of Living Green were interesting. Future researchers could be to modify Living Green according to the feedback received during the interviews and test it another time.

In addition, future researches should seek to replicate these findings in other contexts and other populations other than students. For instance, it would be interesting to do a similar research with consumers or younger generations.

8.1 **Final remarks**

When I first proposed the idea of my bachelor project, I had only a vague idea of what I wanted to do. My initial objective was to create a platform where consumers could receive some points because they had performed some sustainable activities. I could never have thought that I could end up in doing this type of project.

I am very happy to have used this approach because I think it is very innovative. Gamification was something new for me and it is a subject that was not taught at my university. I had to read books and inform myself on the subject with the precious advice of my professor. In addition, at the beginning I was thinking that I was not the right person to do this type of project because I have never played video games or this sort of games. Therefore, I really had some doubt about it and I did not know from where to start.

After the initial hesitation and with the help of the books, I started to build something. And I really enjoyed it because this activity was very interesting, creative and I could create something that was mine. The more I was thinking about it and the more ideas were coming out. I think it has been a great experience and, as already mentioned, this approach is very innovative. While I was building my model, I thought many times that what it is missing in my school is exactly something like this: a way to be creative, to find new solutions, to break the limits and the barriers. I am not saying that gamification is the only way to do it, but my school should consider offering courses that go in this direction.

I found gamification very interesting. In this paper I just brought a few examples and case studies of it, but in the books that I have read there were plenty of them. And you understand that real life is full of gamification or games and that in some way every individual likes to play a sort of game. You discover that human beings love to play games and therefore why not applying it in another context? It is indeed a very good idea. Then, not all the situations are the right one and it is better to leave this field to specialists because there are many things to consider. The gamified system that I designed and proposed – Living Green – is just a very simple example.

Another aspect where initially I had some doubt was the paper prototype. Since it was my first time that I was working with it, I was afraid that the prototype was not good and that it could not give the impression that it was as a real interface. At the same time I was also very curious and excited to know the results of the paper prototype experience. Even if it was just part of the methodology and it was not the final findings that I wanted to bring to this paper, it was very important for me to check this aspect. Surprisingly, the results were good and the reaction of the users was positive. When I was explaining to some friends what I was developing on paper, they did not give me very good feedback or they were doubtful about it. But when I tried on users it was incredible. It was similar to a real interface and the interaction was pretty good and this gave me a lot of satisfaction.

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Appendix 1: PESTEL

POLITICAL	ECONOMICAL	SOCIAL	TECHNOLOGICAL	ENVIRONMENTAL	LEGAL
<ul style="list-style-type: none"> - Kyoto Protocol - EU: Climate and Energy Package - Rio+20 - Carbon tax - Pay per bag disposal - Cap and trade scheme 	<ul style="list-style-type: none"> - Sovereign debt crisis - High unemployment rate in EU zone - Combined GDP of BRICS countries larger than GDP of US and Europe - 1.2 billion people live in extreme poverty in the world - Strong economic growth in emerging countries 	<ul style="list-style-type: none"> - World population: 7.2 billion (2013) - World population forecast: 9.6 billion (2050) - Sustainable gap (attitude VS action) - Social media (1.23 billion monthly active users on fb) - Generation "G" - Healthy trend (fitness, food, etc.) - Car sharing and car pooling 	<ul style="list-style-type: none"> - Smartphone very present - Video games: MMORPG - New App on smartphone - Efficient public transport in CH - Solar power - Wind power - Electric car and electric bike 	<ul style="list-style-type: none"> - Deterioration of eco-system - Climate change and global warming - Loss of biodiversity 	<ul style="list-style-type: none"> - Privacy regulations - Virtual currency regulations

Appendix 2: Activities in the Project

Energy savvy	Level	Points
Go around in your office/ school/ home and switch off the lights you do not use	1	5
Review your energy bill	1	6
Switch off your computer when you do not use it	1	8
Get information how energy is produced in your region	2	20
Unplug your phone charger when your phone is fully charged	2	22
Unplug electronics when you do not use it	2	30
Find an article on the web about energy consumption and share on your dashboard	3	50
Use energy consuming light bulbs	3	60
Take a shower in 5 minutes	3	60
Mobility	Level	Points
Walk to go shopping	1	5
Walk to go to school	1	6
Use public transport instead of car	1	8
Share a car with other people	2	20
Walk regularly for short trip	2	22
Use public transport regularly	2	30
Enrol in car sharing program	3	50
Enrol in car sharing program	3	60
Use the train for a long trip	3	60
Foody	Level	Points
Eat fruits regularly	1	5
Eat vegetable regularly	1	6
Shop local fruit/vegetable	1	8
Choose a healthier option for a meal on the go	2	20
Buy organic eggs	2	22
Learn about meat	2	30
Find out what there is inside the food you buy regularly	3	50
Go to a local market to do groceries	3	60
Pick up your takeout in reusable container	3	60
Water	Level	Points
Drink tap water at home	1	5
Drink tap water at school	1	6
Bring your water from home when you are on a trip	1	8
Use a reusable water bottle	2	20
Turn off the faucet when brushing teeth	2	22
Learn why water is important	2	30
Read article about water pollution	3	50
Find out what there is inside the detergent you use to wash your clothes	3	60
Learn about water scarcity in the world	3	60
Second life	Level	Points
Recycle pet	1	5
Recycle paper	1	6
Recycle alu	1	8
Buy recycle paper	2	20
Buy recycle toilet paper	2	22
Sell an item you do not use	2	30
Buy a used item	3	50
Donate a item you do not use	3	60
Do the compost	3	60
Informed buyer	Level	Points
Check where the food you buy come from	1	5
Check how your favourite brands produce (materials, place, etc.)	1	6
Read an article about supply chain	1	8
Buy local food	2	20
Read about labels and certification	2	22
Check which efforts is doing your favourite brand to reduce the ecological footprint	2	30
Buy product which have low environmental impact	3	50
Buy product with environmental label	3	60
Buy bio product	3	60

Move your body	Level	Points
Walk 10 minutes	1	5
Take the stairs instead of the elevator	1	6
Do stretching for 5 minutes	1	8
Walk 20 minutes	2	20
Commit to do physical activity regularly	2	22
Choose your physical activity	2	30
Do your physical activity twice a week	3	50
Train regularly	3	60
Do a competition	3	60

Appendix 3: Questionnaire

Question 1

How often do you use social networks?

- ☐ Never
- ☐ Once a month
- ☐ Twice a month
- ☐ One or two times a week
- ☐ Almost every day
- ☐ Every day

Question 2

If in the previous question you have put never, please skip this question

Please rank from 1 to 6 the activity you do most on social networks (6 being the activity you do most, 1 being the activity you do less)

	Share personal information (picture, feelings, mood, etc.)
	Share public information (news, events, etc.)
	Play games
	Check profile of other users and comment/like, etc.
	Exchange private message with other users (chat, mail, etc.)
	Others:

Question 3

How often do you play games (video games, app on the mobile phone/tablet, sport, games on social networks, board game etc.)?

- ☐ Never
- ☐ Once a month
- ☐ Twice a month
- ☐ One or two times a week
- ☐ Almost every day
- ☐ Every day

Question 4

Which type of games do you play most? You can answer **maximum 2 questions**.

- ☐ Video games (e.g. PlayStation, etc.)
- ☐ Games on mobile phone/tablet (app)
- ☐ Games on computer
- ☐ Sport
- ☐ Board game (e.g. trivia pursuit)
- ☐ Others:
- ☐ None

Question 5

Do you usually play game alone (i.e. against the computer) or with/against other people (**only one answer possible**, put what you do more often)

- ☐ Alone
- ☐ With others people

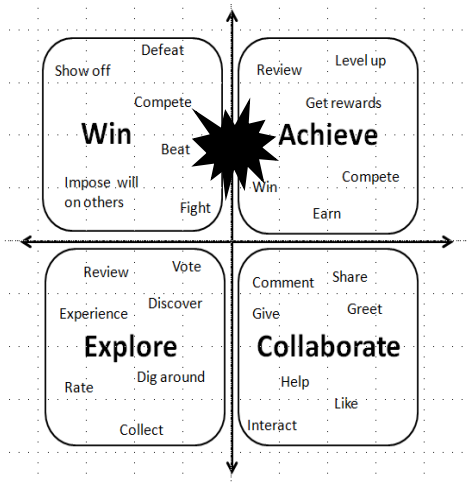
Question 6

Why do you play game?

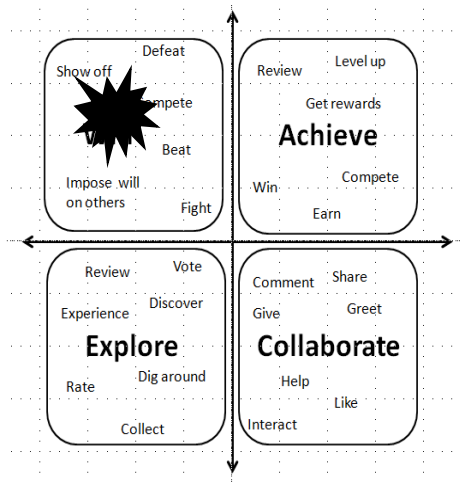
Please place yourself in one of the 4 main boxes (i.e. Achieve, Win, Explore, Collaborate).

Example: if you think that you usually like to “Win” and “Achieve”, please place yourself in the middle (Example 1). If you think you usually only like to “Win” please place yourself more on the left (Example 2)

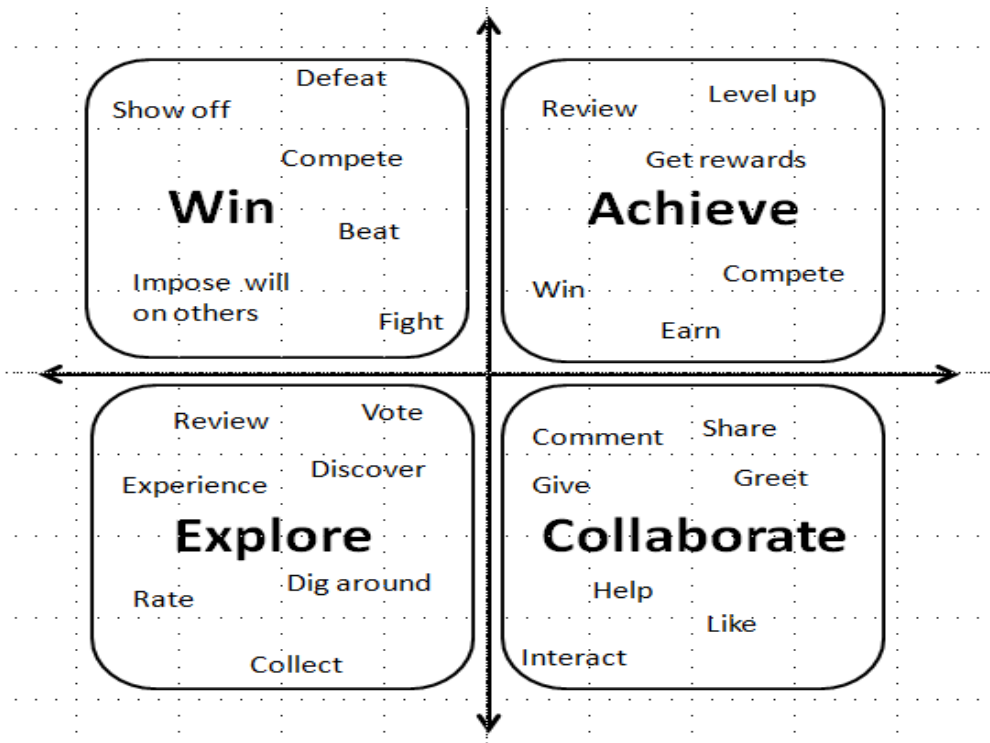
Example 1



Example 2



I play games because I like to...



Question 7

Please indicate your degree of interest in games that are played on an electronic interface such as PlayStation, app on the mobile phone/tablet, games on computer, etc.

- ☐ Considerable interest
- ☐ Moderate interest
- ☐ Little interest
- ☐ No interest at all

Question 8

How would you define yourself as a gamer?

- ☐ Addict gamer
- ☐ Moderate gamer
- ☐ Occasional gamer
- ☐ I am not a gamer at all

Question 9

Gender

- ☐ Male
- ☐ Female

Question 10

Age

- ☐ 18-20
- ☐ 21-23
- ☐ 24-26
- ☐ 27 and over

Question 11

- ☐ In which country did you grow up?

.....

- ☐ Where are you from

.....

Appendix 4:

Introduction to the Usability Test

Before the test

Facilitator:

"Thank you for coming here. Today, I will ask you to perform 3 activities. The first one is to fill in this form (i.e. questionnaire). The second one is to test a paper prototype. The final one is to answers some questions about your experience with the prototype. So, now you can fill in this document (hand in the questionnaire)"

Explanation of the test

Facilitator:

"This is the paper prototype. Basically, the document that you are looking at (the main screen of the prototype will be shown) is a screen of a computer/app. At the beginning, it could be a bit weird for you which is totally normal. You might have some issues in understanding it, but I am here to guide you. What I will ask you is to perform certain activities with the prototype and I will also make the actions/interactions as I would be the processor/computer. For this reason, it might feel that your interaction with the screen is quite slow which is totally normal. If you do not understand anything or something is not clear do not fear to tell me. This is a prototype, so I might have forgot something or I might have designed something wrong. Therefore, the issue is the prototype and not you. The idea of testing it, it is that you give me feedback in order to improve it."

Explanation of the home page of the screen

Facilitator:

"Now, more concretely about the prototype. It is a program/app that it could be implemented in your school. The idea of it is to try to motivate people to do sustainable actions. Ok, now we will start the test. Do you have any questions?"

So, the name of the app/program is "Living Green". Just below the logo, there is your picture, then your name, then below there should be a badge – I will explain later on what is this exactly – and then what you have achieved – I will provide more details about it later. On the right of the logo:

- the first box is for "Green points"*
- then there are some "Hearts"*
- After there is a "Wallet" which contains "Coins" and finally there is a button to use these coins.*

Below them, there is the empty bar "Search" and you can type for example the name of other users.

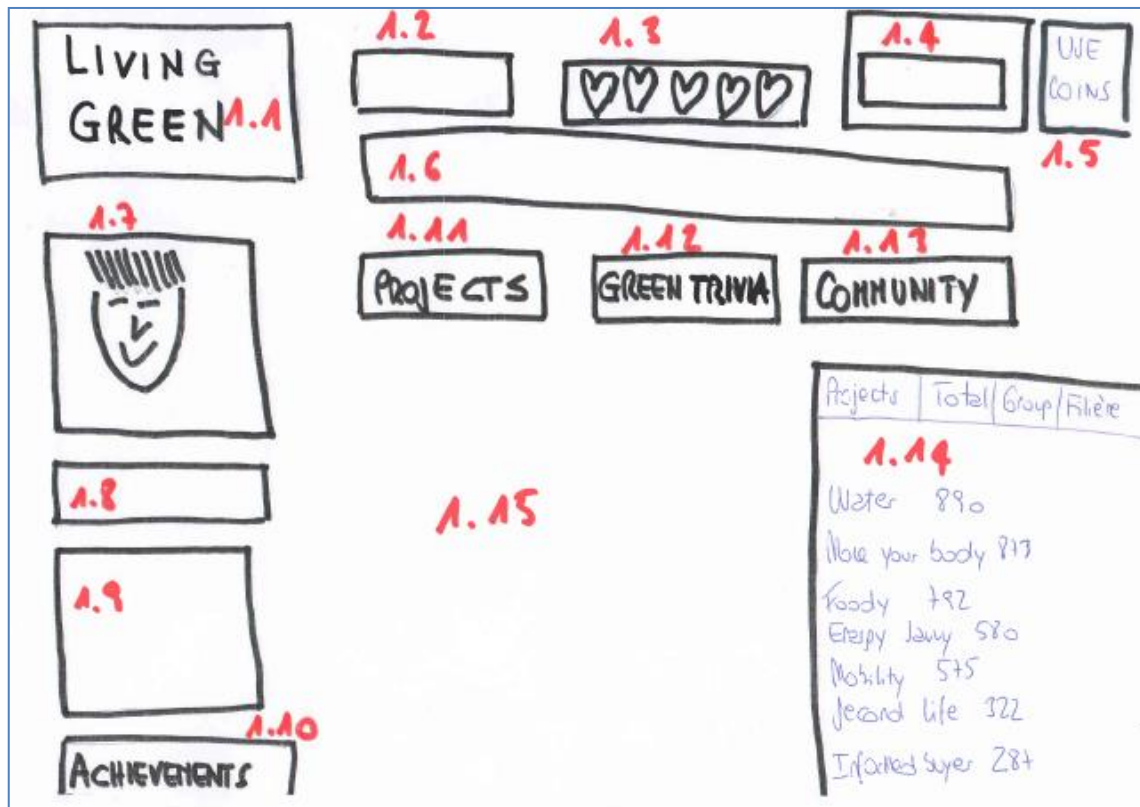
Below it, there are 3 boxes: the "Projects", "Green Trivia" and the "Community".

Finally, on the bottom right, there are several leader board (like rankings).

Before interacting with the screen, please tell me if everything is clear."







Appendix 5: Paper prototype – Main Screen

Main Screen of Living Green



- 1.1. Logo of Living Green
- 1.2. Green Points
- 1.3. Hearts
- 1.4. External box: Wallet
Internal box: Coins
- 1.5. Use Coins
- 1.6. Empty bar
- 1.7. Picture of user
- 1.8. Name of user
- 1.9. Last badge achieved
- 1.10. Achievements
- 1.11. Projects
- 1.12. Green Trivia
- 1.13. Community
- 1.14. Leaderboards
- 1.15. Empty space used during the activities

Appendix 6: Guide Usability Test – Projects

FACILITATOR	COMPUTER *
(Initial situation)	- Main screen
So now, please click with your finger the box projects .	- Put “seven projects” on the screen - Put green piece of paper “Project”
Here you go, now you see that there are several projects: “energy savvy”, “mobility”, “foody”, “water”, “second life”, “informed buyer” and “move your body” Now, I ask you to click on the “ mobility ” button.	- Green piece of paper “Project” - Put “Mobility - Level 1”
Thank you. Now, you see that there are different activities that you can do. Let’s assume that now you commit to “walk to go shopping” and you actually do it. Now you can click on the right, where there is the empty square .	- Green piece of paper “Project” - +5 points - Total points: 5 - 1 earth red - Put a  on the activity completed
Thank you. Let’s assume that now you commit to “walk to go to school” and you actually do it. Now you can click on the right, where there is the empty square .	- Green piece of paper “Project” - +6 points - Total points: 11 - 2 earths red - Put a  on the activity completed
Thank you. Let’s assume that now you commit to “use public transport instead of car” regularly and you actually do it. Now you can click on the right, where there is the empty square .	- Green piece of paper “Project” - + 8 points - Total points: 19 - 3 earths red - Put a  on the activity completed
Ok perfect, let’s try another project now. Please click again on project.	- Total points 19 - 3 earths red - Green piece of paper “Project” - Put different projects on the screen
Now you can choose another project (here the users will be able to choose the project)	- Total points 19 - 3 earths red - Green piece of paper “Project” - Put level 1 of the project decided by the user.
Thank you. Now, you see that there are different activities that you can do. Let’s assume that now you commit (activity depends on the project decided by the user). Now you can click on the right, where there is the empty square .	- Green piece of paper “Project” - + 5 points - Total points: 24 - 4 earths red - Put a  on the activity completed
Thank you. Let’s assume that now you commit..... (activity depends on the project decided by the user). Now you can click on the right, where there is the empty square .	- Green piece of paper “Project” - +6 points - Total points: 30 - 5 earths red - Put a  on the activity completed
Thank you. Let’s assume that now you commit (activity depend on the project decided by the user..... (activity depends on the project decided by the user). Now you can click on the right, where there is the empty square .	- Green piece of paper “Project” - 5 earths red - + 8 points - Total points: 38 - Put a  on the activity completed

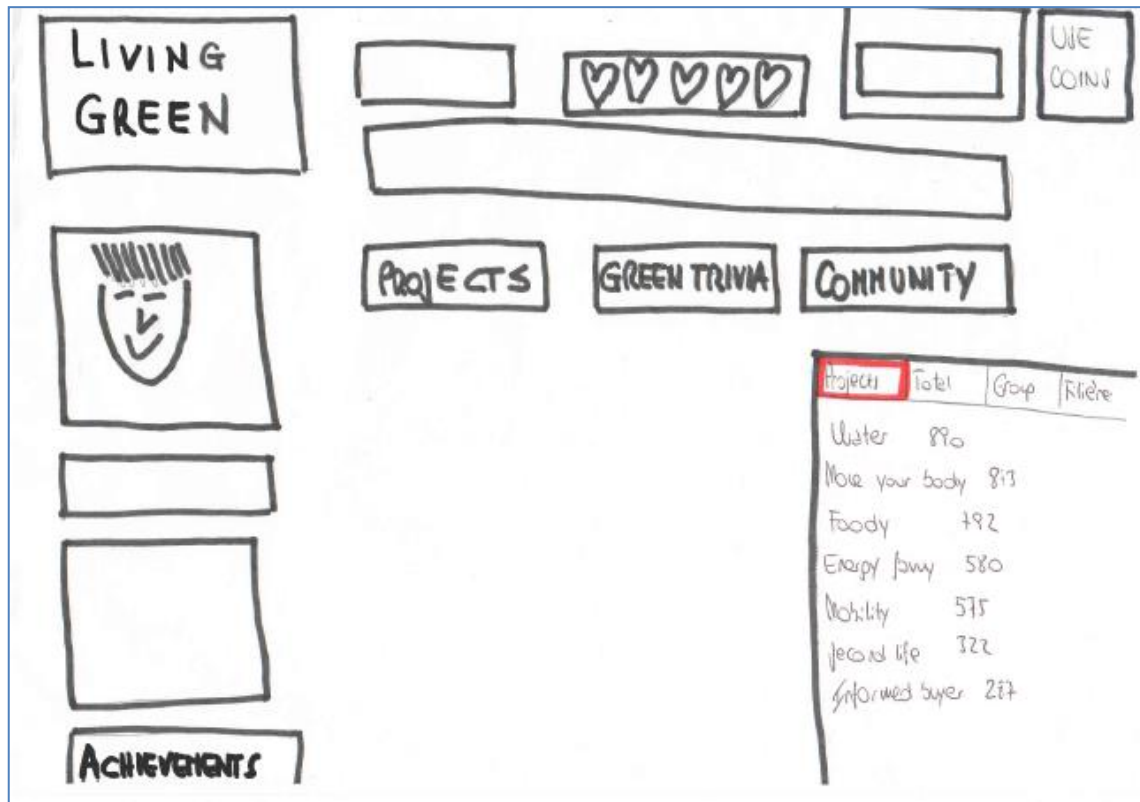
*In “**bold**” in the column computer: new pieces of paper (the new elements) that appear on the screen after the user has interacted with the gamified system.

What is written in “normal” in the column computer: elements (pieces of papers) that are still present on the screen from the previous step.

Appendix 7: Paper prototype – Projects

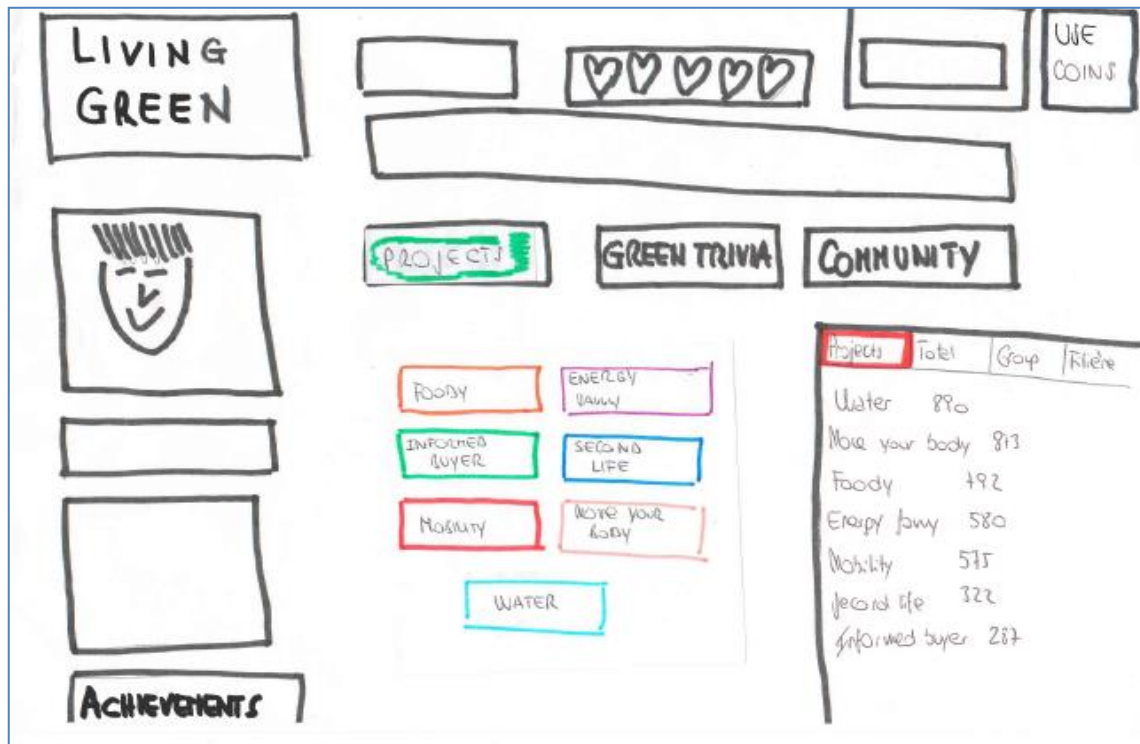
The following screen is an example of the usability test that have been performed to test the prototype. In the first screenshot, we can see the initial situation.

7.1. Main screen of Living Green



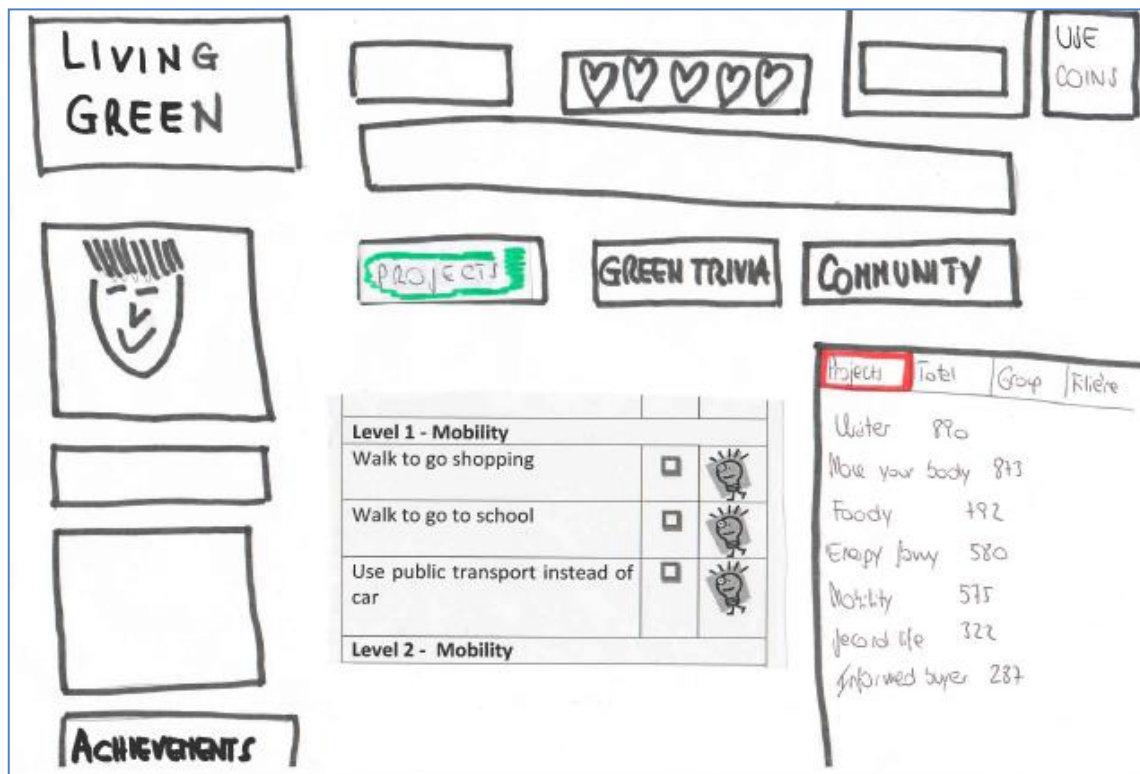
Then, the facilitator asks the user to go in the “Project” section and after the user touches the button project, the button project is highlighted in green and all the projects appears: “Foody”, “Energy savvy”, “Informed buyer”, “Second life”, “Mobility”, “Move your body and Water” (see next screenshot).

7.2. Screen when user touches the button "Project"



In the next screenshot, the facilitator asks the user to choose the "Mobility" project. After the user has touched the icon mobility, the first level of "Mobility" comes out and the user can choose the action that he wants to take.

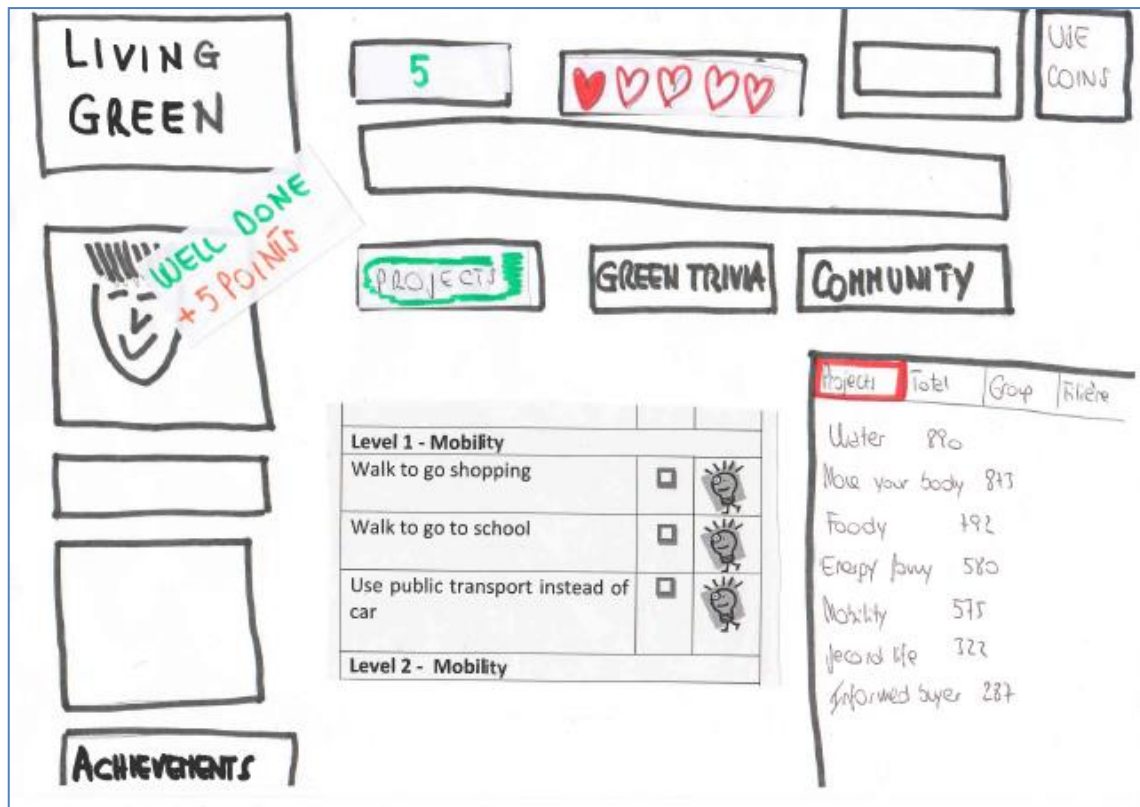
7.3. "Mobility" project, Level 1



The actions have been written on computer and printed. This has been done because my pen writing is not very clear and it would have been difficult for the user to understand the actions. Since it was important to make the user understand the activities, the printed option has been chosen.

After the user commit to do the first activity (i.e. “walk to go shopping”), the user receive five “Green Points” and one “Heart” (see next screenshot). Users commit to do the activity, by ticking the box on the right of action.

7.4. User receive five Green Points and one Heart for the first activity



When a user commits to do an activity, she has to tick the box on the right of the activities. The image on the right of the box is a light: if user wants to get more information on the activities and on the advantages of taking the associated activity, she can click on that light and she will receive the appropriate information.

In every phase of the project, all the pieces of paper have been prepared in advance. In the following box is possible to see the elements that have been prepared for the test of the “Projects”.

7.5. Paper prototype elements for the usability test of the Projects



Appendix 8: Guide Usability Test – Community 1

FACILITATOR	COMPUTER
(Initial situation)	Main screen with: <ul style="list-style-type: none"> - 3 hearts - Total points: 38
Now, I kindly ask you to click on the “Community “ button	- Put blue-sky piece of paper “Community”
Here, it is a bit different than before. You have to assume that what I am showing you now is at the same place in the screen as before. For technical reason I was not able to put this part on the same format as before. So now, what you see here are others users that have posted some sustainable actions that they have performed; they took a picture and they have posted it. In addition, other users have posted news from the web which refers to sustainability. In the first picture, you see one user (i.e. “Frank”) who went swimming. You can either vote or comment what he has posted.	<ul style="list-style-type: none"> - Community blue-sky - 3 hearts - Total points: 38 - Show the community to user.
Now I ask you to vote this picture . You can decide how many stars you want to give to him. From 1 to 5.	<ul style="list-style-type: none"> - Total points: 38 - Community Blue-sky - Put the number of stars that the user tell you on the post of Frank - 2 hearts red - + 5 coins ;Wallet: 5 coins
Now I ask to put a comment on one of the 4 activities (either picture or news)	<ul style="list-style-type: none"> - Total points: 38 - Community Blue-sky - 1 heart red - + 2 coins; Wallet: 7 coins
Now I ask to put a comment on another one (either picture or news)	<ul style="list-style-type: none"> - Total points: 38 - Community Blue-sky - 0 hearts - + 2 coins; Wallet: 9 coins
Now I ask to put a comment on another one (either picture or news) (See the reaction, wait until the user does something. Ask the user what he/she should do. The objective is to make the user click on “Project”)	<ul style="list-style-type: none"> - 0 hearts - Wallet: 9 coins - Total points 38 - Community Blue Sky Show message “Sorry this action is not possible. You need hearts. To get hearts , go back to “Projects”
(Once the users will have click on Project, show the type of project available)	<ul style="list-style-type: none"> - 0 hearts - Wallet: 9 coins - Total points 38 - Put different project on the screen - Green Project
Now you can choose another project (here the users will be able to choose the project)	- Put level 1 of the project decided by the user
Thank you. Now, you see that there are different activities that you can do. Let’s assume that now you commit (activity depends on the project decided by the user). Now you can click on the right, where there is the empty square .	<ul style="list-style-type: none"> - Green project; - Wallet 9 coins - + 5 points - Total points: 43 - 1 earth red - Put a <input checked="" type="checkbox"/> on the activity completed
Thank you. Let’s assume that now you commit..... (activity depends on the project decided by the user). Now you can click on the right, where there is the empty square .	<ul style="list-style-type: none"> - Green project; - Wallet 9 coins - + 6 points - Total points: 49 - 2 earths red - Put a <input checked="" type="checkbox"/> on the activity completed
Thank you. Let’s assume that now you commit..... (activity depends on the project decided by the user). Now you can click on the right, where there is the empty square .	<ul style="list-style-type: none"> - Green project; - Wallet 9 coins - + 8 points - Total points: 57 - 3 earths red - Put a <input checked="" type="checkbox"/> on the activity completed

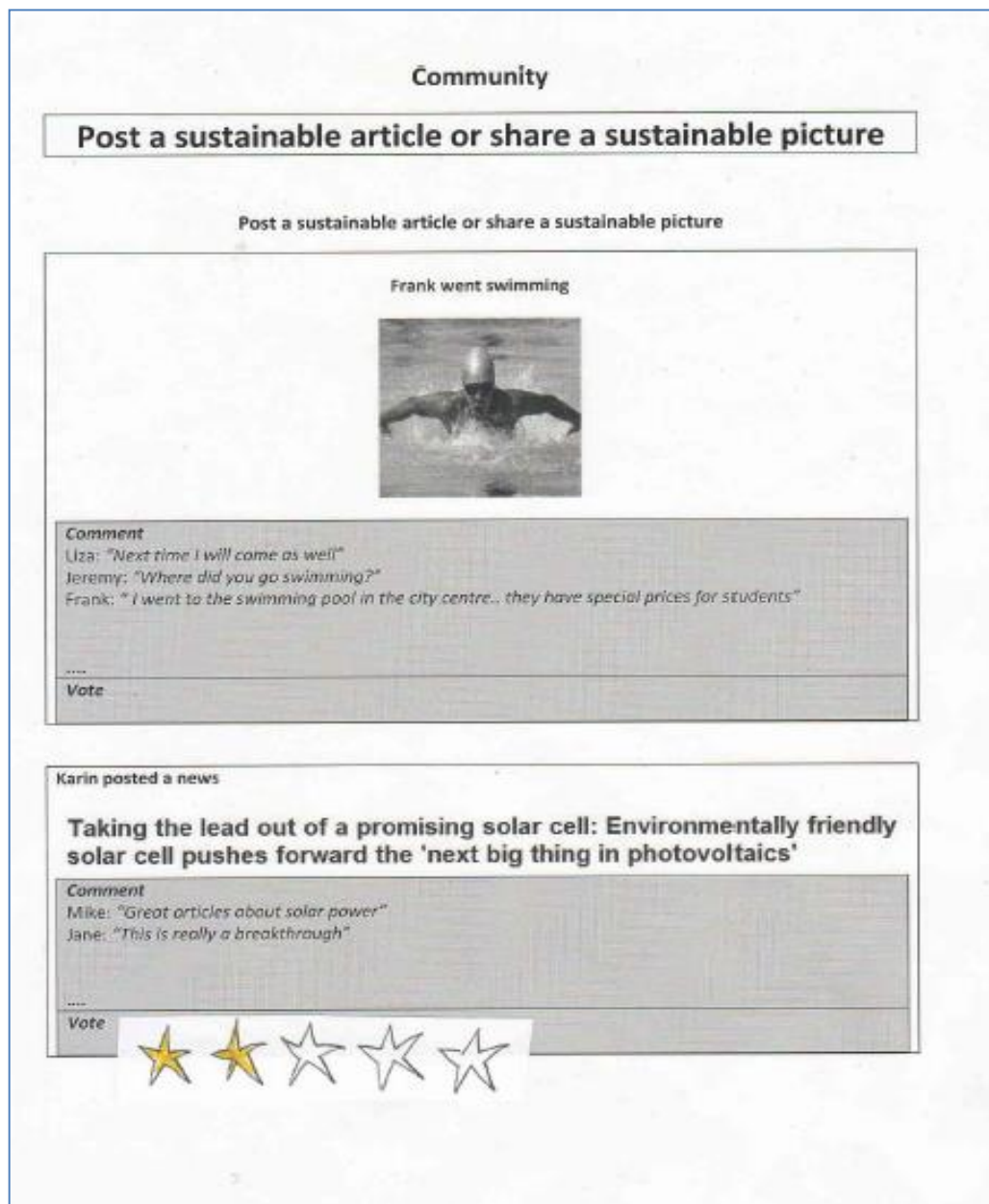
Appendix 9: Guide Usability Test – Community 2

FACILITATOR	COMPUTER
(Initial situation)	Main screen with: <ul style="list-style-type: none"> - Total points: 57 - Wallet 9 coins - 3 earths red
Now imagine that you want to post a picture or share an article – you can click on the “Community” button	<ul style="list-style-type: none"> - Total points: 57 - Wallet 9 coins - 3 earths red - Community blue sky - Show the community to user
Imagine that now you bought a bike and that you want to share it with the community. So you post the picture of your new bike on the community page. You see that the amount of coins in this case is larger than before when you voted or commented. This is due to the fact that doing an action requires more time and effort than just voting or commenting.	<ul style="list-style-type: none"> - Community blue sky - Total points: 57 - Community with bike - Wallet 39 coins - 2 earths red - +30 coins
Imagine that now you found an interesting article on the web and you want to share it with the community. So you post the news on the community page. Now, I have one question. How many article/comment you can do? (the answer should be just one because the user have only 1 heart)	<ul style="list-style-type: none"> - Community blue sky - Total points: 57 - Community with news - Wallet 59 coins - 1 earth red - +20 coins
Best article/action of the month: At the end of the month, based on the vote that others users will give you, the best article/action will receive additional coins: best article 50 coins; best action 70 coins.	<ul style="list-style-type: none"> -

Appendix 10: Paper prototype – Community

In the following screenshot is possible to see how the “Community” was in the paper prototype. In the first picture there is a user (i.e. Frank) who posted a picture of himself (e.g. he went swimming). Then after the picture, there are the comments of other users.

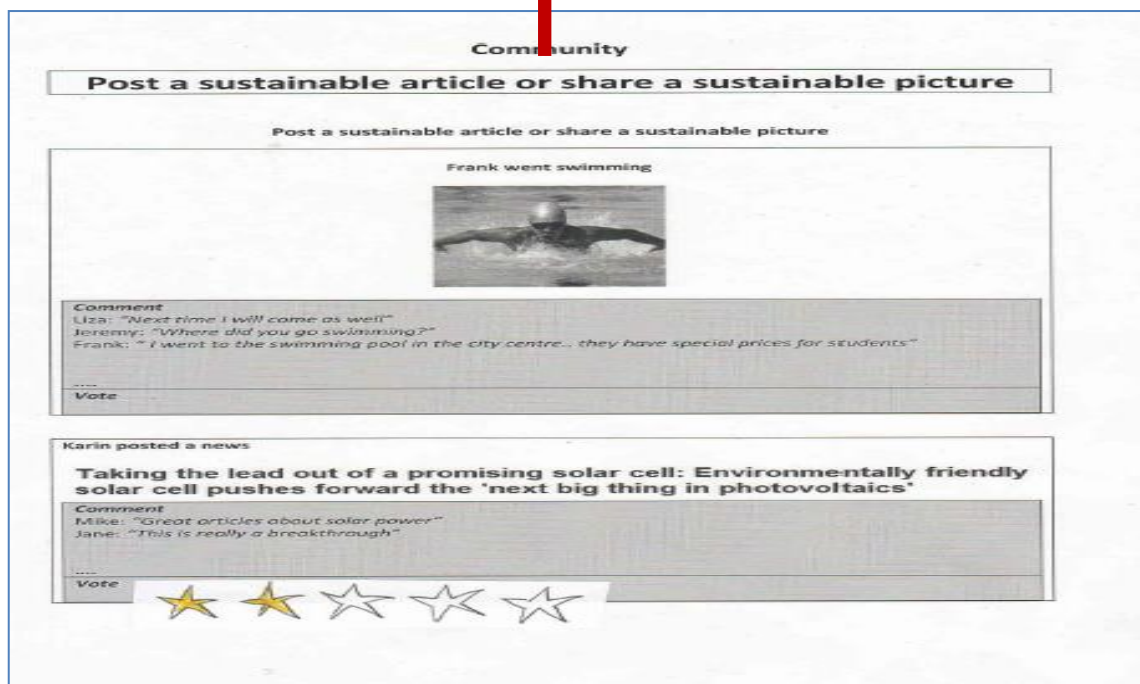
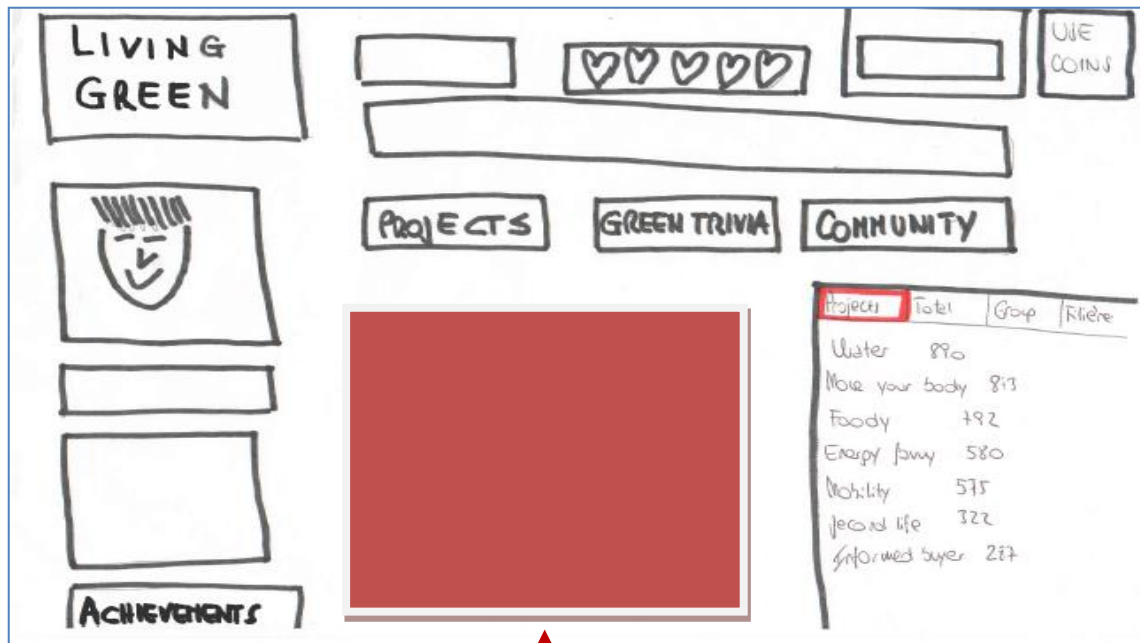
10.1 An example of the Community



The second post is a news that another user has shared with the community (i.e. news about solar cell). In this example, the user who was conducting the usability test has decided to vote for this article and she gave two stars.

During the design of the paper prototype was difficult to design the “Community” inside the hand-sketched prototype. Therefore, during the usability test when it was tested the community part, users had in front of him two papers: the main screen and the community paper (computer-printed paper). Users had to imagine that the printed paper was included in the hand-sketched main screen.




10.2. During the usability test it was explained to the users that the printed version was supposed to be where there is the red square



Appendix 11: Guide Usability Test – Wallet

GUIDE	COMPUTER
(Initial situation)	Main screen with: <ul style="list-style-type: none"> - Total points: 57 - Wallet beige 165 coins - 3 earths red
Now we are going to repeat what we have done in previous test. Now imagine that you want to post a picture or share an article – you can click on the “Community” button	<ul style="list-style-type: none"> - Total points: 57 - Wallet beige 165 coins - 3 earths red - Community blue sky - Show the community to user
Imagine that now you bought a bike and that you want to share it with the community. So you post the picture of your new bike on the community page	<ul style="list-style-type: none"> - Community blue sky - Total points: 57 - Community with bike - Wallet beige 195 coins - 2 earths red - +30 coins
Imagine that now you found an interesting article on the web and you want to share it with the community. So you post the news on the community page. Did you notice that the colour of the wallet has changed: now is brown. In fact, when you reach 200 coins, you have a new wallet. <i>(Show the rules for the coins-wallet)</i>	<ul style="list-style-type: none"> - Community blue sky - Total points: 57 - Community with news - Wallet brown 215 coins - 1 earth red - +20 coins

Appendix 12: Guide Usability Test – End Level

FACILITATOR	COMPUTER
(Initial situation)	Main screen with: <ul style="list-style-type: none"> - Total points 57 - Wallet 215 - 1 earth red
Now please click with your finger the box projects .	<ul style="list-style-type: none"> - Total points 57 - Wallet 215 - 1 earth red - Green Projects - Different project on the screen
Now, I ask you to click on the “foody button”	<ul style="list-style-type: none"> - Green Projects - Total points 57 - Wallet 215 - 1 earth red - Foody level 2
Thank you. Let’s assume that now you commit to “Choose a healthier option for a meal on the go”. Now you can click on the right, where there is the empty square .	<ul style="list-style-type: none"> - Green Projects - Wallet 215 - + 20 points - Total points: 77 - 2 earths red - Put a  on the activity completed
Thank you. Let’s assume that now you commit to “Buy organic eggs”. Now you can click on the right, where there is the empty square .	<ul style="list-style-type: none"> - Green Projects - Wallet 215 - +22 points - Total points: 99 - 3 earths red - Put a  on the activity completed
Thank you. Let’s assume that now you commit to “Learn more about meat”. Now you can click on the right, where there is the empty square . In this case, you will have to read an article about meat and you will not have to do an activity.	<ul style="list-style-type: none"> - Green Projects - Wallet 215 - + 30 points - Total points: 129 - 4 earths red - Put a  on the activity completed - “To end level 2, you need to take a quiz”
So imagine now you want to finish level 2 of the Foody project. Click on “Take Quiz” . Now you have to read a news/article and when you are done you will have to answer some questions about what you have just read. When, you finish reading the news, you can click on “Test your knowledge” .	<ul style="list-style-type: none"> - Green Projects - Total points: 129 - 4 earths red - Wallet 215 - Organic food focus
Now you can answer the three questions	<ul style="list-style-type: none"> - Green Projects - Total points: 129 - 4 earths red - Wallet 215 - 3 questions about organic food
Perfect (assuming the user answer all the questions correctly), now you can access level 3 of the foody project. Click on “Go to next level” For completing the level, you have received as well a badge.	<ul style="list-style-type: none"> - Green Projects - Total points: 129 - 4 earths red - Wallet 215 - Well done! End of This level – Go to the next level - Badge on the main screen

Appendix 13: Paper Prototype – End Level

The following are two examples of the test that users had to take at the end of the level. The first one is about Organic Food (Project Foody) and the second one is about Energy (Project Energy savvy)

Organic food (Box A)

Organic food refers to how farmers grow the agricultural products. Land farmed organically are not polluted by pesticides and do not use fertilizers. Organic farming practices allow reducing the contamination of water and soil. If a farmer uses organic food is able to produce the land in the long term. This practice has positive effect on the plants and animals around the land (increase of biodiversity)⁴

Test your knowledge

Box B

Organic food uses pesticides

- ☐ True
- ☐ False

Organic farming practises reduce pollution of soil and water

- ☐ True
- ☐ False

Land farmed organically has negative effect on the plants and animals around the land

- ☐ True
- ☐ False

At the beginning, it was shown the news/article (Box A) to users and then they had to answer to the questions. When the users touch “Test your knowledge” button, the article disappears and the set of three questions appears on the screen (Box B).

Energy (Box A)

In Swiss homes, energy-efficient technologies could save each year between 5 and 6 TWh of electricity, two times the annual production of the nuclear plant of Mühleberg. This potential savings could be realized if all Swiss opt for the energy-efficient technologies when replacing their appliances. Number of municipalities and cantons promote energy-efficient technologies by providing subsidy.⁵

SOURCE: http://www.wwf.ch/fr/agir/vivre_mieux/eco_conseils/construire_habiter/habitat_detail.cfm?uTippld=135

Test your knowledge

⁴ SOURCE: <http://www.ofrf.org/organic-faqs>

⁵ SOURCE: http://www.wwf.ch/fr/agir/vivre_mieux/eco_conseils/construire_habiter/habitat_detail.cfm?uTippld=135

Box B

Energy-efficient technologies could save between 2 and 3 TWh of electricity in Switzerland

- ☐ True
- ☐ False

In Mühleberg there is a nuclear plant

- ☐ True
- ☐ False

If you use energy-efficient technologies you have to pay a tax to the Canton

- ☐ True
- ☐ False

Appendix 14: Guide Usability Test – Green Trivia 1

FACILITATOR	COMPUTER
(Initial situation)	Main screen with: <ul style="list-style-type: none"> - Total points: 129 - 4 earths red; - Wallet 215 - Badge on the main screen
Please click with your finger the Green Trivia button .	<ul style="list-style-type: none"> - Total points: 129; 4 earths red - Wallet 215 - Badge on the main screen - Green Trivia pink item
Here, it is as before. For technical reason, you have to assume that what I am showing you now is at the same place in the screen as before. So now, what you will see here is a quiz that you can do either against the computer or against another user of the community. First, let's do it against the computer "Living Green".	<ul style="list-style-type: none"> - Total points: 129; - 4 earths red - Wallet 215 - Badge on the main screen - Green Trivia pink item - Against living Green/against a friend
Click on Against Living Green	<ul style="list-style-type: none"> - Total points: 129; - 4 earths red - Wallet 215 - Badge on the main screen - Green Trivia pink item - Show "Choose number of coins you want to bet against green trivia"
Now let's assume you want to bet 20 coins (Show the users that the coins are diminished.)	<ul style="list-style-type: none"> - Total points: 129; 4 earths red - Green Trivia pink item - Badge on the main screen - Put number 20 coins - Wallet 195 - Show the test – version 1
Now, you can answer the questions with this pen. (Assuming the users do not get all the answer correctly; only 6 correct).	<ul style="list-style-type: none"> - Total points: 129; - 4 earths red - Wallet 195 - Green trivia pink item - Badge on the main screen - test – version 1 - Sorry you got only 6 answers correct. Try another time"
Let's try again. So now, please click with your finger the Green Trivia button .	<ul style="list-style-type: none"> - Total points: 129; - 4 earths red - Wallet 195 - Green trivia pink item - Badge on the main screen - Against living Green/against a friend
Click on Against Living Green	<ul style="list-style-type: none"> - Total points: 129; - 4 earths red - Wallet 195; - Green Trivia pink item - Badge on the main screen - Show "Choose number of coins you want to bet against green trivia"
Now let's assume you want to bet 40 coins (Show the users that the coins are diminished.)	<ul style="list-style-type: none"> - Total points: 129; - 4 earths red - Badge on the main screen - Green Trivia pink item - Put number 40 coins - Wallet 155 - Show the test – version 2
So now answers quickly the questions please. (Assuming the users answer all the questions correctly; 7 correct)	<ul style="list-style-type: none"> - Total points: 129; - 4 earth red - Wallet 155; - Green Trivia pink item - Badge on the main screen - test – version 2 - "Great. You got all the answer correct. Get your prize at the slot machine". Show the slot machine
Please click on the slot machine. (make the sound of the slot machine turning)	<ul style="list-style-type: none"> - Total points: 129; - 4 earth red - Badge on the main screen - Green Trivia pink item - 2*40 = 80 coins (in the image of the slot machine) - Wallet 235

Appendix 15: Guide Usability Test – Green Trivia 2

FACILITATOR	COMPUTER
Now we try the second option: against another member of the community. Please click with your finger the Green Trivia button .	Main screen with: <ul style="list-style-type: none"> - Total points: 129 - 4 earths red - Wallet 235 - Badge on the main screen - Against living Green/against a friend - Pink Green Trivia
Click on Against a friend	<ul style="list-style-type: none"> - Total points: 129 - 4 earths red - Wallet 235 - Badge on the main screen - Pink Green Trivia - Show “Choose number of coins you want to bet against your friend”
Now let’s assume you want to bet 40 coins against another member of the community (Show the users that the coins are diminished) Here, the amount bet is the same for you and your opponents; in reality you need to agree with the other user on the amount you want to bet.	<ul style="list-style-type: none"> - Total points: 129 - 4 earths red - Badge on the main screen - Pink Green Trivia - Put number 40 coins - Wallet 195
Now, you can answer the questions.	<ul style="list-style-type: none"> - Total points: 129 - 4 earths red - Wallet 195 - Badge on the main screen - Pink Green Trivia - Show the test – version 3
(When it ends the questions) (Assuming he/she answers 5 questions correctly and the opponent only 4.)	<ul style="list-style-type: none"> - Total points: 129 - 4 earths red - Badge on the main screen - Test version 3 - Pink Green Trivia - Wallet 255 - When the user ends the questions “You won! You got 60 coins”

Appendix 16:

Paper Prototype – Green Trivia

The following is an example of the questions asked during the usability test for the Green Trivia.

Taking a bath saves more water than taking a shower?

- ☐ True
- ☐ False

How many nuclear plants there are in Switzerland?

- ☐ 0
- ☐ 3
- ☐ 5
- ☐ 15

In 2012, how much was the generation of renewable energy? (% of the total generation of energy)

- ☐ 0%
- ☐ 3%
- ☐ 10%
- ☐ 20%

Switzerland consumes lots of energy. Which fuel provides the most energy? Rank the object

- ☐ Thermal power plants
- ☐ Hydropower plants
- ☐ Nuclear power plants

Which sector consumes most of energy? Rank the objects

- ☐ Residential
- ☐ Services
- ☐ Industrial
- ☐ Transportation

What portion of the world's species are found in the tropical rainforest

- ☐ 1/3
- ☐ 1/2
- ☐ 2/3
- ☐ all

Which crop uses the most of pesticides?

- ☐ Cotton
- ☐ Coffee
- ☐ Sugar
- ☐ Grape

Appendix 17: Guide Usability Test – Use Coins

FACILITATOR	COMPUTER
Now we will see how to use the coins So now, please click with your finger the box “Use coins”	Main screen with: <ul style="list-style-type: none"> - Total points: 129 - 5 earths red - Wallet 255 - Badge on the main screen - “Use coins” highlighted - USE YOUR COINS ITEM with 4 options
So, this is what you can do with your coins. First you can buy and offer to a friend a virtual gift. Then you can donate your coins for a project (plant a tree) or to a friend. Then you can also customise your badges (have special badges, different colour, etc.) and you can also redeem your coins. Now, I show you what you can do with “Redeem you coins” . So please click on “Redeem you coins”	<ul style="list-style-type: none"> - Total points: 129 - 5 earth red - Wallet 255 - Badge on the main screen - “Use coins” highlighted - CONVERT YOUR COINS ITEM with all the options how user can convert the coins
So, for example for 100 coins you can get a healthy meal at the cafeteria of your school. Then, with 500 coins you will receive a Hoody, and with 2000 coins you will be offered a weekend where you will be able to do sport activities. Now I show you another option on how you can use your coins. So, please click with your finger “Use Coins” .	<ul style="list-style-type: none"> - Total points: 129 - 5 earth red - Wallet 255 - Badge on the main screen - “Use coins” highlighted - USE YOUR COINS ITEM with 4 options
Choose “Buy and offer virtual gift” .	<ul style="list-style-type: none"> - Total points: 129 - 5 earth red - Wallet 255 - Badge on the main screen - “Use coins” highlighted - Show flower (20 coins), cake (10 coins), smile (5 coins)
Here you can decide to buy virtual item and offer to another member of the community. For example is the birthday of a friend and you can buy a cake and offer to your friend. Next option. So go back and click with your finger “Use coins” .	<ul style="list-style-type: none"> - Total points: 129 - 5 earth red - Wallet 255 - Badge on the main screen - “Use coins” highlighted - USE YOUR COINS ITEM with 4 options
Click “Donate your coins”	<ul style="list-style-type: none"> - Total points: 129 - 5 earth red - Wallet 255 - Badge on the main screen - “Use coins” highlighted - Donate your coins to a friend or plant a tree (50)
In this case, you can donate your coins to a friend or decides to donate to an association that for example will plant a tree. Go back and click with your finger the Use coins	<ul style="list-style-type: none"> - Total points: 129 - 5 earth red - Wallet 255 - Badge on the main screen - “Use coins” highlighted - USE YOUR COINS ITEM with 4 options
Click “ Customise your badges”	<ul style="list-style-type: none"> - Total points: 129 - 5 earth red - Wallet 255 - Badge on the main screen - “Use coins” highlighted - Show 2 balls yellow and orange (5)
In this case, you can change for 5 coins the colour of your badge.	-

Appendix 18: Guide Usability Test – Achievements

FACILITATOR	COMPUTER
<p>Now we will see where you can find all the badges you have collected.</p> <p>Click on Achievements</p>	<p>Main screen with:</p> <ul style="list-style-type: none"> - Achievement orange - Total points: 58 - 2 earths red - Wallet 22 - Badge on the main screen - Show several badges
<p>Depending on the level you have cleared, you can have several badges. For every project there is a badge; so there are seven projects and you can have a maximum of seven badges. Let's assume that you have completed the second level of the Foody project, the badge that you had received at the end of level 1 will be replaced by the badge of level 2.</p> <p>So if other users want to check your profile, they will be able to see what you have achieved and whether you are a good "citizen"/player" or not.</p> <p>Now let's assume you want to check the profile of another user: John. So you can write the name of John in the empty bar.</p>	<ul style="list-style-type: none"> - Achievement orange - Total points: 58 - 2 earths red - Wallet 22 - Badge on the main screen - Show several badges
<p>So, what you can see is the following:</p> <ul style="list-style-type: none"> - The green part is what is related to you - The black square is everything about John. So if another user wants to see your profile, is what he/she will be able to check. <p>Here, there are a couple of things, that I would like to share with you:</p> <ul style="list-style-type: none"> - Achievements - Points - The wallet: as you can notice, you are not able to see how many coins John owns. On the other hand, you can see the colour of the wallet. So this means that you are able to have an idea of how many coins John have, but not the exact quantity. - In addition, you can see the dashboard of John (the activities, the news he has posted and commented or voted) 	<ul style="list-style-type: none"> - Put the new screen with John's profile

Appendix 19: Paper prototype – Achievements

The following is the screen that appears to the user when she touches the “Achievements” button. She is able to see the badges that she has received so far.

19.1. Screen when user touches the button “Achievements”

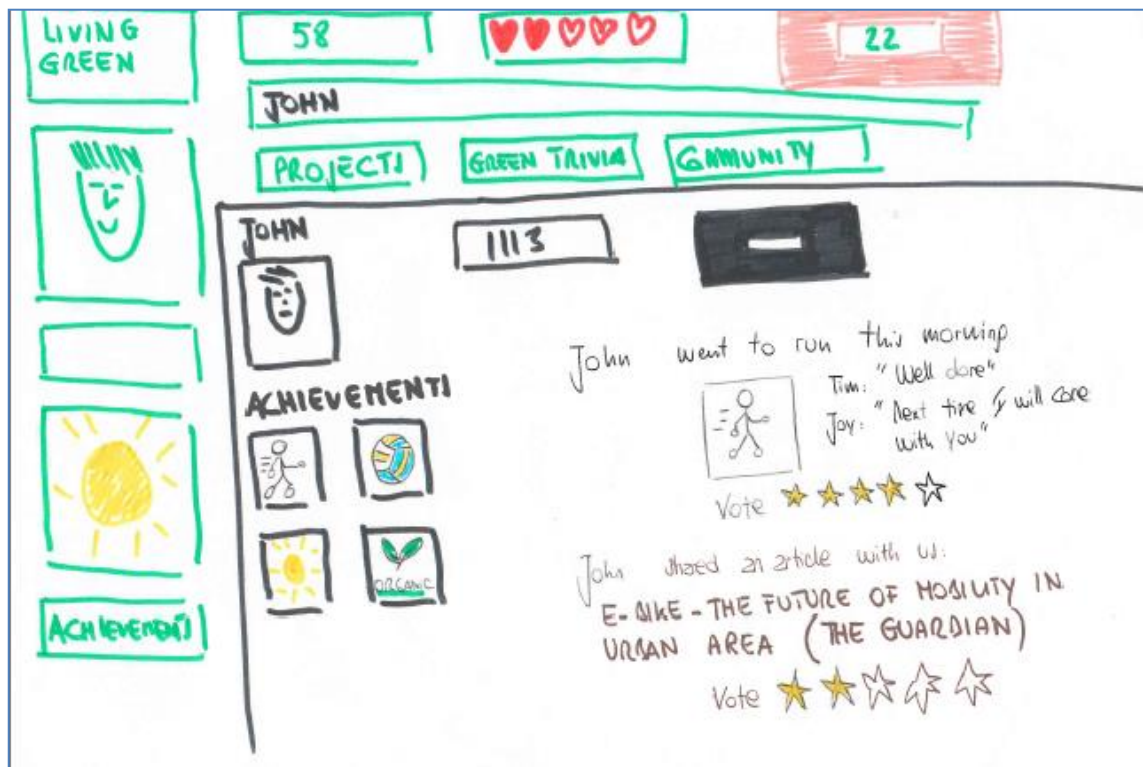


In the top right is also possible to see the wallet (it should be beige, but the scanner did not do a good job) with inside 22 coins.

When users want to check the profile of another user (i.e. John), they will have to write his/her name on the empty bar. In the following screenshot for example a user checked the profile of John. The “Green part” is the same as in the previous screenshot while the black part is the profile of John.

Therefore users will see the badges of John, the Green points, the picture and the social interaction of John with the “Community”. One feature that will be different is the “Wallet”: the user will be able to check the colour of the wallet but not the amount that there is inside it (for example John has a black wallet).

19.2. Screen when user types the name of another user



Appendix 20: Guide Usability Test – Leaderboards

FACILITATOR	COMPUTER
<p>Last tool I want to show is the leaderboard.</p> <p>So, here there is different type of rankings. The first ranking is about the different project in general terms.</p> <p>The second one is about how you are performing against the others.</p> <p>Then, you can also create a group and compete within the group or against other group.</p> <p>Finally, there is the ranking of your branch against the HES branches.</p> <p>Please, click on the total leaderboard.</p>	<p>Main screen with:</p> <ul style="list-style-type: none"> - Total points: 129 - 4 earths red - Wallet 255 - Badge on the main screen - Change screen total with ranking # 58
<p>Now go in projects</p>	<ul style="list-style-type: none"> - Total points: 129 - 4 earths red - Wallet 255 - Badge on the main screen - total with ranking # 58 - Project green - All the projects
<p>Do the project Energy savvy. Let's assume that you have completed already level 1. So, now I give to you the activities for level 2. Let's assume you now decide commit to do the first activity: you decide to share a car with other people for a trip (it could be to school, for shopping, etc.).</p> <p>As you can see, now your ranking as increased from number 58th to number 56th.</p>	<ul style="list-style-type: none"> - Project green - Wallet 255 - Badge on the main screen - Level 2 of Energy savvy - Total points: 149 - 5 earths red - + 20 points - Change screen total with ranking # 56.

Appendix 21: Semi-structured interview

General impression about the gamified system	
Guide	<u>Potential questions:</u> <ul style="list-style-type: none"> ➤ How was the experience overall? ➤ How did you find “Living Green”? ➤ Was it a new experience for you (gamification and paper prototype??) ➤ Was it realistic? ➤ Did you have fun in performing the different activities? ➤ Or better, would it be fun using this tool?
Rating	How is your general impression about this tool? <ul style="list-style-type: none"> ○ Excellent ○ Good ○ Quite good ○ Average ○ Bad ○ Very bad
User friendliness of the gamified system	
Guide	<u>Potential questions:</u> <ul style="list-style-type: none"> ➤ Do you think that it is easy to use or difficult? Which part? Why? ➤ Which part of the tool you most preferred? Why? ➤ Which part of the tool you did not enjoy? Why? ➤ Which part would you change? How? ➤ Which part would you improve? How?
Rating	Please rate the user friendliness of the tool <ul style="list-style-type: none"> ○ Excellent ○ Good ○ Quite good ○ Average ○ Below average ○ Bad
Effectiveness of the tool	
Guide	<u>Potential questions:</u> <ul style="list-style-type: none"> ➤ Do you think is an effective tool to motivate people to do more sustainable actions? Why? ➤ Even if the tool cannot check you whether you do or not do the activity, would you do them? Do you think it would help you in having a more sustainable behaviour? Why?
Rating	Would you do more sustainable actions using this tool? <ul style="list-style-type: none"> ○ Strongly agree ○ Agree ○ Disagree ○ Strongly disagree

Use of the tool	
Guide	<p><u>Potential questions</u></p> <ul style="list-style-type: none"> ➤ Would you use this tool if there was one in your school? Why? ➤ Do you think it would be better to implement in a work environment? Why? ➤ Would other students use it? Why?
Rating	<p>I would use a similar tool implemented in my school/work environment</p> <ul style="list-style-type: none"> ○ Every day ○ Once a week ○ Once a month ○ Never
Game mechanics opinion	
Guide	<p><u>Potential questions</u></p> <ul style="list-style-type: none"> ➤ Would you use it for the final reward (i.e. free meal, hoody, week-end) or just because you enjoyed using this tool? Why? ➤ What do you think about the single elements of the tool? <ul style="list-style-type: none"> ○ Green point – Projects - Level ○ Coins (collection, use of coins, etc.) ○ Community? ○ Hearts (limit?) ○ Wallet (different colours) ○ Final end-test ○ Trivia (slot machine, against friend) ○ Badges-Achievements ○ Leaderboard? Would it motivate you? ○ Rewards (Virtual, donate, virtual gifts or real prize?)
Rating	<p>Generally, please rate the quality of the elements used in this tool</p> <ul style="list-style-type: none"> ○ Excellent ○ Good ○ Average ○ Poor

Appendix 22: Transcripts

User 1

Profile

1) Use of social network: every day	8) Type of gamer: moderate gamer
2) Rank of the activity:	6)
3 Share personal information	
4 Share public information	
2 Play games	
6 Check profile of other users	
5 Exchange private message	
- Others:	
3) Frequency of playing game: 1 or 2 times a week	9) Gender: male
4) Game preference: Video games and games on mobile	10) Age: 24-26
5) Play a game alone or with others: alone	11) Country (grow up): Switzerland
7) Interest in games: considerable interest	12) Country (origin): Switzerland and Italy

Interview

How did you find Living Green?

"I think that is interesting and is very user-friendly. It is intuitive."

What about the paper prototype?

"Paper prototype was realistic and the experience itself was fun. If it existed in reality I would go and try just after."

Was Living Green user friendly?

"For not being on the computer, it was very user friendly."

Which part would you change?

"In addition to the hearts I would add "energy" or something similar. Maybe people do not understand as it is. The hearts was not clear if it was my life, the energy, ..."

"The system itself of the hearts is clear. The fact that user has to go back in the project and they do not stay all the time in the community is good. The thing that I would change is the hearts. I would explain them better. I would write clearer what it is: life, energy...".

Do you think is an effective tool to motivate people to do more sustainable actions?

"It makes you learning, you learn by doing things. The social media part is interesting because you can share with people. I think if I were 5 years younger I would use for sure. I remember when I was at school they talked about sustainability and environment, it is important to do the action for learning."

Even if the tool cannot check you whether you do or not do the activities, would you do

them?

"If you can control is always better but I don't know how you could. I don't think that people that would use it, they would have an interest to cheat. Even though, the fact that there are rewards could lead some people to abuse it. So in this case some people might just go through the project and do it quickly."

"An idea could be that another user certifies what other users had done."

"But the only fact that user has to read, they will maybe learn and at one point they will do the action."

"Another idea would be to force people to read the content. For example create a text where user will have to go through, like slides, one after the other. So there is not just a text but users are forced to go through."

"If I were forced to use this tool, it would help me doing more sustainable activities because probably half of them I am not doing right now."

Would you use this tool if there was one in your school

"If it were implemented in my school, I would probably not use it because I do not have so much free time. I am wondering if I had one hour and I decide to play this videogame and another one, what I would do. I might try it but I am not sure. If I were forced I would use it but otherwise probably not."

"Maybe I would use it from time to time just to check what other user are doing but not in an active way. My condition to use once a month: the onboarding must be good otherwise I will never use it."

"The final target of this tool should be young people. It could be very effective if the target are people between 10-20 years old. It could be used also in school to educate young people which are 10-20 years old"

"At our age is a bit too late and we think about finishing the school and starting working, maybe we don't have the time and is too late to start with this philosophy and routines. However, for younger people – let's say 10-15 years old, even younger – I think is the perfect time to learn how to behave and be responsible from a sustainable point of view. It is the best way to learn, it is not too late to change your habits, and is the exact time that you want to be on social networks, to do challenges, to get rewards. And even parents, they would prefer children to be on this social network than on Facebook because there are interesting things. As a parent I would prefer my kid to be on this kind of game rather than on traditional video games."

"I never played Farmville on Facebook and I cannot understand how people of my age or even older can play these kinds of games."

"The way that is conceived is perfect for younger people. You do not have to change anything."

Game mechanics opinion

Physical Rewards: "I would use for the real rewards, because I can redeem my coins."

Virtual gift: "I would not use them"

Customise badge: "For younger people not for me"

Donate: "Charity or plant a tree is good"

Project: "The selected topic of the project are well chosen"

Collection coins: "It is good for the engagement. Engagement is what it matters. Important for the engagement of people is the content and the rewards which I think are good in Living Green"

Colour of the wallet: "It is a kind of ranking so I think is interesting. Especially for people who are driven by challenges. They will be driven by increasing the coins and the colour, I am driven by these things"

Test end level: "Important because at least user have to do something"

Green Trivia: "Slot machine: It is a good idea. It brings the "casino" thing which is good."

"It is fair the fact that users have to answer all the questions correctly in order to win. Especially because they have the possibility to learn the topic in advance. I don't think is useful to make it too easy."


"And it makes also sense when against a friend: the better win."

Badges/Achievement: "It is good; it is like the colour of the wallet. It is good to have achievement and badges. Then I would not use the coins to change the colour of my badge but this is another thing."

Leaderboards: "it will motivate me."

User 2

Profile

1) Use of social network: every day	8) Type of gamer: moderate gamer												
2) Rank of the activity: <table border="1"> <tr> <td>3</td><td>Share personal information</td></tr> <tr> <td>2</td><td>Share public information</td></tr> <tr> <td>1</td><td>Play games</td></tr> <tr> <td>5</td><td>Check profile of other users</td></tr> <tr> <td>4</td><td>Exchange private message</td></tr> <tr> <td>6</td><td>Others: check news and info for new product, events, etc.</td></tr> </table>	3	Share personal information	2	Share public information	1	Play games	5	Check profile of other users	4	Exchange private message	6	Others: check news and info for new product, events, etc.	6) 
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2	Share public information												
1	Play games												
5	Check profile of other users												
4	Exchange private message												
6	Others: check news and info for new product, events, etc.												
3) Frequency of playing game: 1 or 2 times a week	9) Gender: male												
4) Game preference: video games and sport	10) Age: 21-23												
5) Play a game alone or with others: with others	11) Country (grow up): Spain												
7) Interest in games: moderate interest	12) Country (origin): Spain												

Interview

How did you find Living Green?

"It is really nice, it is very interesting, it is very simple to use, and you understand very quickly how things go."

Was it something new for you?

"I have already seen something similar with Nike where you move your body and you receive some points. The only thing that I have to say is the fact that you click and nobody can check if people really do the action or not. Especially because at the end you can earn something physical and it might incentive people to cheat. It could be a risk."

Paper prototype was it realistic?

"I had the impression that was real."

Was Living Green user friendly?

"It was very easy to use."

Do you think is an effective tool to motivate people to do more sustainable actions?

"The quality of the actions could be increased. Some actions are good but maybe we don't want to change, like taking a shower in 5 minutes."

"I think there is a chance that this tool would help people doing more sustainable activities."

"But for me, I already do most of the activities, so for me would be important the type of activities in the project. They must be interesting."

"For example I already drink tap water. What it could be interesting would be to ingrate with the location system where I can find the tap water because in some countries is not always easy to find tap water. In some place tap water is good but in some other is not that good."

"The activities should be adapted at my personal situation."

Even if the tool cannot check you whether you do or not do the activities, would you do them?

"I suppose that who will use this tool would be honest people. However I think that there might be some risks, minor risks"

"A point that I found negative is the sport activity in the community. I would have used other examples. Sport is sustainable for yourself but not for the environment. You could have chosen a better example."

"In addition, I would put a reminder on the phone with an app that reminds you to do the activity. It would help to do the activity because sometimes we do not have the time to go on every app, so a reminder would help. Sometimes we have so many applications that we do not go on all of them. It depends on the behaviour of people. "

Would you use this tool if there was one in your school

"It could be fun. I think there is more motivation if we do with somebody else with the community."

"I think that students in HES would use it because it would not take so much time. Instead of taking the bus to walk from the Tour of Carouge is only 10 minutes walking to go to school. So yes I think."

In a work environment? In a big company?

"It could be fun. I don't see difference between using in a school or in work environment. Perhaps in a big company they will be able to show that they are good. If you do it in a school is more about the student doing the sustainable activity. For a company is more the company showing that they are doing more sustainable activity by providing a tool to its employees. For the reputation and the image."

Game mechanics opinion

Physical rewards: "I would not use it just for the physical reward. It is not what it would motivate me to use the tool."

"My question now is: how are you going to implement it if a lot of users want the physical gift. It will be very expensive. How are you going to pay for it?"

"Perhaps you should try with something cheaper at the beginning and require user to have more coins and then see how it goes."

Virtual gift: "It is really good."

Customise badge: "I would offer a way for user to customise their badge. They should be able to decide how to customise their badge. It could reinforce the creativity of other users. And then also offer the possibilities to sell the badge to other users."

Project: "Project should be interesting; otherwise I would not use it."

Use coins: "It should be offered to user to buy points with coins. There should be a possibility to exchange coins with points. And because I am not looking for the final prize for me would be important to exchange coins with points."

Collection coins: "Good because is something that you do on your own. The points are the system that tells you what to do. But coins are something that you decide to do. So is good to receive coins and to differentiate in this way."

Colour of the wallet: "You can know the level of other users without knowing the coins they have. I think is good."

Test-end level: "I think it is important because is a way to inform user. In the project there is something to do. The test is about knowledge."

Hearts: "I understand when it increases and when it decreases but at the beginning I had some issues in understanding it. After you explained to me, it became clear and now it makes sense"

Would it limit you? "It does not limit me and I think is good to have it."

Green Trivia:

"I think is fair enough that users have to answer correctly all the question to win against the computer."

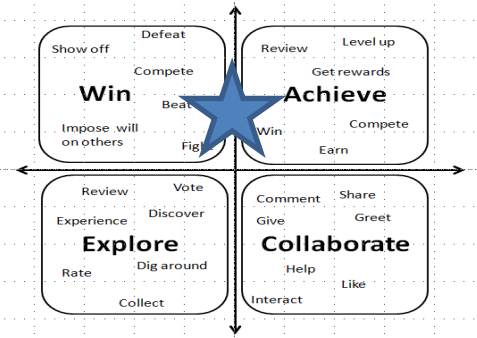
Slot Machine: "I think is useless. For me it does not make too much sense."

Badges/Achievement: "I think is good. There is in most of the games. It could be fun to have it."

Leaderboards: "It is good to have it. It can be fun."

User 3

Profile

1) Use of social network: every day	8) Type of gamer: moderate gamer												
2) Rank of the activity: <table border="1"> <tr> <td>3</td><td>Share personal information</td></tr> <tr> <td>2</td><td>Share public information</td></tr> <tr> <td>1</td><td>Play games</td></tr> <tr> <td>6</td><td>Check profile of other users</td></tr> <tr> <td>5</td><td>Exchange private message</td></tr> <tr> <td>4</td><td>Others: group work coordination (school)</td></tr> </table>	3	Share personal information	2	Share public information	1	Play games	6	Check profile of other users	5	Exchange private message	4	Others: group work coordination (school)	6) 
3	Share personal information												
2	Share public information												
1	Play games												
6	Check profile of other users												
5	Exchange private message												
4	Others: group work coordination (school)												
3) Frequency of playing game: every day	9) Gender: male												
4) Game preference: game on mobile phone and sport	10) Age: 24-26												
5) Play a game alone or with others: with others	11) Country (grow up): France												
7) Interest in games: moderate interest	12) Country (origin): France												

Interview

How did you find Living Green?

"It was good, fun and the tool seems to be interesting. It was easy to use and it was simple to understand how was working. It was very similar to games that I have already used. Even somebody that uses it for the first time, he will understand very easily."

Was it something new for you?

"It was new. It's interesting because there is the game side but at the same time you can learn new stuff."

Paper prototype was it realistic?

"Of course it was slower than a computer but it was realistic. The fact that it was slow did not prevent the understanding of the tool."

Was Living Green user friendly?

"Even if you were not here explaining, in reality I could probably have used it without any issue. I think that in reality, I could use it without any problem after a few minutes. So, it was very simple to use."

"The part that I most preferred was the one of the quiz."

Do you think is an effective tool to motivate people to do more sustainable actions?

"I think that yes, even if it is not possible to check whether a person do the activity or not because the people who would use this tool are already intrinsically motivated to live in a sustainable way. On the other hand a person who is not interested in sustainability would never use this tool."

"A person who is interested in having a more sustainable behaviour would use this platform and would have a more sustainable behaviour."

"I personally think that I would use it because I like games and I try to live respecting the environment. What is important for me are the activities that are suggested to do. They must be interesting and new"

for me. The activities should surprise me, the information that the tool give must be something new. For this reason I think that the light on the right of the box where you tick, it is very useful.”

Even if the tool cannot check you whether you do or not do the activities, would you do them?

“There should be a way to check whether a user do in reality the activities, otherwise too many people would cheat. “

“For example, when recycling the pet you could put a QR code to be scanned with the smart phone and then automatically will be updated in the tool. Therefore for me it should be possible to check it; obviously it will require a lot of work to be done. “

Would you use this tool if there was one in your school?

“I think that some students could use it. If I have to give a percentage, I think that 20% of the students could use it.”

“Perhaps, I think it could be more successful a tool that is more proactive. For example, I would create a sustainable city with some avatars. Like Farmville. In this way the game side would be emphasised and more people will be interested. If people behave in real life in a more sustainable way, the virtual city will progress. With this option, I think you would be able to attract more users. At the beginning the city would be very polluted and more users do sustainable activities, more the city become clean.”

In a work environment? In a big company?

“It should be adapted at the work environment and I also think that adults are more interested in the sustainability aspects and not at the game aspects.”

“Adapted in the right way could work and in addition the top management could offer special reward to the employees who are doing better.”

Game mechanics opinion

Physical rewards: “Prizes are key to engage people that do not live in a sustainable way. It depends also on the type of the offer. If you want to attract people who are not interested in sustainability, the type of present is very important. They must be important.”

“Personally are not important for me. I would use the tool even without them.”

“In general rewards -virtual and not were ok. They are all interesting. It would be important to modify them from time to time. For example, a company could do ads on this tool and they could provide the gifts.”

Project: “The points, levels were very clear and were well done. Important would be that the activities of the project are interesting.”

Collection coins: “They were clear and are good to have points and coins. It adds something to the experience. Important is also to have the picture and the news of the month. In this way, people will post interesting things. It will increase the level of the information posted in the community.”

Test-end level: “It is necessary. With a test people will really read in depth the information”

Hearts: “They are important because in this way people have to go to the project and they do not just stay in the community. For me they were not a limit.”

Wallet: “I would have changed the colour. I would have done silver gold, like the medals. However, I don’t think that it make much sense to have the colour. I would not disturb me if other user would see how much coins I own. I don’t need the same privacy as it would be real money. The best solution for me would be to show the coins and the colour of the wallet to other user. So I would keep the colour of the wallet but I wouldn’t hide the content. The colour will be as levels or classes.”

Green Trivia: “Trivia was very good. Maybe I wouldn’t put that when a user play against the computer, he will lose all the coins if he does not answer all the questions correctly. Maybe I would put that 5 questions are enough to win.”

“The slot machine was good. I wouldn’t put a slot machine that there is risk to lose coins. But in this


way is ok. It creates a sort of suspense and uncertainty that might appeal to some users. “

Badges/Achievement: “Badges are good. Especially because when a friend sees that another friend has a specific badge, the first one will try to have the same badge.”

Leaderboards:” I think is useful. I would use it in order to understand in which field I have to improve and also against my friends.”

User 4

Profile

1) Use of social network: every day	8) Type of gamer: occasional gamer												
2) Rank of the activity: <table border="1"> <tr> <td>4</td><td>Share personal information</td></tr> <tr> <td>3</td><td>Share public information</td></tr> <tr> <td>2</td><td>Play games</td></tr> <tr> <td>5</td><td>Check profile of other users</td></tr> <tr> <td>6</td><td>Exchange private message</td></tr> <tr> <td>-</td><td>Others:</td></tr> </table>	4	Share personal information	3	Share public information	2	Play games	5	Check profile of other users	6	Exchange private message	-	Others:	6) 
4	Share personal information												
3	Share public information												
2	Play games												
5	Check profile of other users												
6	Exchange private message												
-	Others:												
3) Frequency of playing game: once a month	9) Gender: female												
4) Game preference: board games	10) Age: 21-23												
5) Play a game alone or with others: with others	11) Country (grow up): Italy and Switzerland												
7) Interest in games: little interest	12) Country (origin): Italy												

Interview

How did you find Living Green?

"It was interesting and it was new and it could be something that I could use. I like the idea."

Paper prototype was it realistic?

"It was realistic and it was interactive."

Was Living Green user friendly?

"I was quite easy to use. The information is all on the main screen. Everything was there and was not complicated to use."

Do you think is an effective tool to motivate people to do more sustainable actions?

"I guess yes. Probably I would not do everything. It depends on the situation, but then when a user posts an interesting activity in the community, I could do it as well. So yes, I guess I would do more sustainable activities. I would probably pay more attention on the issue."

Even if the tool cannot check you whether you do or not do the activities, would you do them?

"I would do them. What's the point of saying that you have done it and you do not do it?"

Would you use this tool if there was one in your school?

"I probably would use it. I found it fun. The information is interesting and in a certain way is young. For young people. I think this is the right approach to learn something for people of our age. I would for sure try it."

"I think that other students would use it because it is a current subject and the way that is built is for young."

"I think that I would use it because is well done."

In work environment? In a big company?

"I think is less suitable in a company. I would see it better for a school. It could work if it were adapted at the situation."

Game mechanics opinion

Physical rewards: “I would use it even without the physical rewards because I find the tool interesting.”

“Then I would definitely use it. However I would use the tool even if this type of reward was not there. It is an added value but it is not the reason why I would use it.”

Badge customisation: “Not really interesting. I would not use the coins for this.”

Donate coins: “This is interesting. I would probably use for the tree not for a friend.”

Virtual gift: “This I would use. I would spend the coins for this.”

Projects: “I think that the points are useful. The level as well. The higher the level, the better in the project a user is.”

“I think that is important to have a distinction between the points/project and the coins/community. I perceived the coins linked more on what I do and the points more related to what the system tells me to do.”

Collection coins: “It is good and it is useful to have the best post of the month. It will stimulate user to post interesting things. Usually I am not a person that likes to share too much in social networks. But in this case, the fact that I receive coins for posting would probably make me post more often.”

Test-end level: “it is important because probably some users think the boxes even if they do not do the activities. In this way user are forced to read the news in order to answer correctly the questions.”

Hearts: “I think is good to have it. It is a good system for making more sustainable actions in the project. It did not disturb me.”

Wallet: “Visually is interesting. When it changed the colour during the test, it has caught my eye and I thought that I had reached a kind of goal. I had the impression that was a bit like the different credit cards. I had like the impression to have a more important wallet when it changed the colour”.

Green Trivia: “Maybe is too difficult because I had to answer all the 7 questions correctly. Probably I would play more against friends than the computer because I don't have to answer all the questions correctly for winning.”

“Maybe if against the computer I had to answer fewer questions correctly it would be more interesting.”


“I found the slot machine mechanism interesting.”

Badges/Achievement: “Probably if I see another user that has badges of higher value, I would try to do more projects to get the same badges. And the fact of doing more projects will bring me to do more sustainable actions.”

Leaderboards: “It stimulates to have more points and therefore to do more projects.”

User 5

Profile

1) Use of social network: almost every day	8) Type of gamer: occasional gamer												
2) Rank of the activity: <table border="1"> <tr> <td>-</td><td>Share personal information</td></tr> <tr> <td>-</td><td>Share public information</td></tr> <tr> <td>5</td><td>Play games</td></tr> <tr> <td>4</td><td>Check profile of other users</td></tr> <tr> <td>6</td><td>Exchange private message</td></tr> <tr> <td>-</td><td>Others:</td></tr> </table>	-	Share personal information	-	Share public information	5	Play games	4	Check profile of other users	6	Exchange private message	-	Others:	6) 
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4	Check profile of other users												
6	Exchange private message												
-	Others:												
3) Frequency of playing game: 1 or 2 times a week	9) Gender: female												
4) Game preference: game on mobile and games on computer	10) Age: 21-23												
5) Play a game alone or with others: alone	11) Country (grow up): Germany												
7) Interest in games: little interest	12) Country (origin): Germany												

Interview

How did you find Living Green?

"It was really interesting and I think that there is a lot of work behind this interfaces and for sure can be a good to inform people about sustainability issues and to think more about energy saving and toward a life more green."

Paper prototype was it realistic?

"It was realistic and it looked like a real app."

Was Living Green user friendly?

"It was easy to use. There are not too many buttons to touch and it was clear."

Do you think is an effective tool to motivate people to do more sustainable actions?

"I would personally do more sustainable actions using this tool. For example, I have a friend at school that pushed me to recycle everything. Before I was not doing it and then with this friend that almost forced me to recycle I started doing it. And now I am happy to do it. This tool would work as the friend and would make me do more sustainable actions."

Even if the tool cannot check you whether you do or not do the activity, would you do them?

"In addition to the lights, where users can find the benefit of doing some activities, you can add some video for example that would have a bigger impact. Where users will be really surprised and they would really understand why is good to do the activity. If I really see that my effort is good for the environment and I understand why, I think that it would be better and it would be easier to change my behaviour."

"The information should be interesting and should touch the person emotionally."

Would you use this tool if there was one in your school?

"I would use because I think could help in having a better world, a more responsible world."

"For me is more the information that I receive than actually how was built the tool that would help me doing more sustainable activities. For me is not important to receive points and coins. What I value is how useful are the information."

"Anyway this tool would stimulate me to change my behaviour."

"For other students, it would be important the right incentive like for example the sport week end. Otherwise in my opinion most of the students would not use the tool. If they see that they can receive something important back they will use it. For example if they receive some credit for school they would use it."

In work environment? In a big company?

"It could work but I would change the interface. Less game elements, no points, badges and so on. For example a blog at work would work better."

"Anyway, whatever is the solution proposed, it will be important the commitment of top managers. They will have to create the right green culture."

Game mechanics opinion

Rewards: "The reward is really important. A virtual one will not work. For me it is key the reward and must be a real one. I know a game on the internet "Riseforfree". User can play a game and more points they get, more rise will be donated to poor people. I think that most of the people play the game because there is the concrete action behind: the donation of the rice."

Project: "The points are important because make users understand the difficulty of the related actions. Also for the points is important for me, that I could use them to do something. Otherwise for me it does not too much sense."

"Another thing that it should be possible to do with points is that users with a lot of points give advises to other users. This would make sense. Or users could exchange their points for services with other users. I don't remember the exact name but it could be like the time bank where users exchange services with time. You could, I don't know how, implement a similar thing with the points."

Final end test: "It is good because it provides information and you can test what you have just learnt. Like a kind of challenge to check if you have learnt."

Hearts: "I think that is a good idea and it did not disturb me. Maybe I would have used another system than the heart. For example, if I decide to buy a bike and I post it in the community, I do a sustainable action and therefore I do not think that is good to penalise me and having a heart removed."

"For me heart is like a life and therefore was not a good choice. I think that the general idea is good but I would use another system to force user to go back to project. So I would use another mechanism."

Wallet: "I don't think that was very useful to have different colour and that other user could not see the content of the other users."

Green Trivia: "I think that it is correct that you have to answer all the questions correctly."

Slot machine: "It is a bit different; it is an added value and is nice."

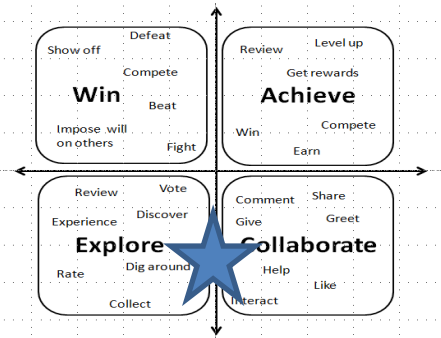
Badges/Achievement: "Badges are good because you can check what the others have reached. It is a bit like the scout or also at the army."

"Here as I already said for the points, it could be that the people who have a higher badge can help the others. They would do it because they want to contribute with their knowledge to help other user to do more sustainable activities."

Leaderboards: "I don't like that users are put on a ranking. It creates competition. For sustainability, people should work together and not being divided by a ranking."

User 6

Profile

1) Use of social network: every day	8) Type of gamer: I am not a gamer at all												
2) Rank of the activity: <table border="1"> <tr> <td>6</td><td>Share personal information</td></tr> <tr> <td>5</td><td>Share public information</td></tr> <tr> <td>-</td><td>Play games</td></tr> <tr> <td>4</td><td>Check profile of other users</td></tr> <tr> <td>3</td><td>Exchange private message</td></tr> <tr> <td>-</td><td>Others:</td></tr> </table>	6	Share personal information	5	Share public information	-	Play games	4	Check profile of other users	3	Exchange private message	-	Others:	6) 
6	Share personal information												
5	Share public information												
-	Play games												
4	Check profile of other users												
3	Exchange private message												
-	Others:												
3) Frequency of playing game: twice a month	9) Gender: female												
4) Game preference: games on mobile and sport	10) Age: 18-20												
5) Play a game alone or with others: alone	11) Country (grow up): Portugal and Switzerland												
7) Interest in games: no interest at all	12) Country (origin): Portugal												

Interview

How did you find Living Green?

"It was interesting. I haven't understood everything, but it was interesting because it was something new. It was simple to use."

Paper prototype was it realistic?

"I had the impression that was a real screen."

Was Living Green user friendly?

"It was quite easy to use. With your explanation it was simple to use. In reality I think that it would be not too difficult to use even without you but I would need some time to explore it. However I think after having seen it, and having explored it, it seems to be easy to use it."

"What it was not very clear was the fact that the coins increase and the heart decrease at the same time."

"I would put the badges achieved all the in the main screen. Maybe of a smaller size."

Do you think is an effective tool to motivate people to do more sustainable actions?

"I guess yes. Probably the fact that I see other people that do the action, would make me as well doing the action. At the end is a game. The points and all prizes stimulate you to participate. For me is not the case. But I like to see what the other users do. But maybe another person would play because want to receive the prize."

"I would do more sustainable actions because I see other people doing it. Not for points or for the prizes."

"The project itself would not make me do more sustainable actions. I would not do a sustainable action because I receive points but because I see another user in the community that has posted the picture and this will stimulate me doing the sustainable actions as well."

Even if the tool cannot check you whether you do or not do the activity, would you do them?

"The fact of just ticking the box would not motivate me to do more sustainable activities. I would just do in order to get the hearts and go back in the community."

"And in general I don't know how the other users would behave because there is not a control. If there was a control it would be different."

Would you use this tool if there was one in your school?

"I would use it but just for the community."

"I would use in general but not in the school. If it was an open website yes."

In work environment? In a big company?

"As said I would just for the community and not for the final prize and for the points."

"I think that it could be successful implementing it in a company."

Game mechanics opinion

Rewards: "I wouldn't use it for the final physical prize."

Project: "Not interested. I would not motivate me doing sustainable actions. It is good for people that like to play game and receive points and put in the ranking. But it is not my case."

Final end test: "It could be interesting because you learn new things. But if to participate at the community I have to answer at the questions in order to receive the hearts, it could be too much for me."

Hearts: "The hearts were useless. I couldn't understand the reason of them. They would disturb me because I don't want to go back in the project every time that I want to vote or comment or post in the community."

"I would probably go back in the project, tick the box without doing the activity just to get the heart and then go back in the community. In the long term this could bring me to use less the app because of the hearts."

"For me is better that there is not a control in the project – if I do the activities or not - because in this way I can just tick and go back in the community."

Wallet: "I think that there is no difference if you show the content of the wallet to other users or not."

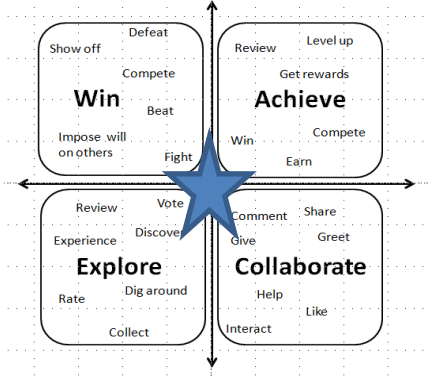
Green Trivia: "I would not use it."

Badges/Achievement: "Not interesting for me."

Leaderboards: "Not interesting for me."

User 7

Profile

1) Use of social network: every day	8) Type of gamer: moderate gamer												
2) Rank of the activity: <table border="1"> <tr> <td>3</td><td>Share personal information</td></tr> <tr> <td>2</td><td>Share public information</td></tr> <tr> <td>5</td><td>Play games</td></tr> <tr> <td>4</td><td>Check profile of other users</td></tr> <tr> <td>6</td><td>Exchange private message</td></tr> <tr> <td>-</td><td>Others:</td></tr> </table>	3	Share personal information	2	Share public information	5	Play games	4	Check profile of other users	6	Exchange private message	-	Others:	6) 
3	Share personal information												
2	Share public information												
5	Play games												
4	Check profile of other users												
6	Exchange private message												
-	Others:												
3) Frequency of playing game: every day	9) Gender: female												
4) Game preference: games on mobile	10) Age: 24-26												
5) Play a game alone or with others: alone	11) Country (grow up): China												
7) Interest in games: moderate interest	12) Country (origin): China												

Interview

How did you find Living Green?

Once you try it becomes clear. It was a new experience for me.

Paper prototype was it realistic?

"It could seem realistic with a little bit of imagination. But if I imagine it in a screen it could seem realistic. "

Was Living Green user friendly?

"It was quite simple to use. I would add an explanation: for example when you click with the mouse on the points, it comes out the meaning of it and how many points you can earn or for the coins the same. For the wallet as well the colours. It would be easier to understand with somewhere explained the rules of the game. Especially for the coins I think is important to have an explanation."

"Your explanation was not important for understanding the tool. It would be even easier to understand without anybody explaining."

Do you think is an effective tool to motivate people to do more sustainable actions?

"The problem is that you cannot be sure whether a person do or not the activity. For this reason I don't know if it is effective. It is difficult to estimate."

"However, if the goal of this tool is to inform, maybe they read the information and maybe they would do some actions. In this sense I think it would be useful. The problem that I see, if this is the goal, is that the manager of the platform will lose the money because at the end there are real rewards. If people do not do the things and you have a cost for this, I think it is a bit useless."

"If this tool is designed to give tips to user, I think that around twenty percent would do the activity. The majority of people know that they can earn something and they would use it just for this."

Would you use this tool if there was one in your school?

"From time to time I would use it. It depends on the prizes. However, if all my friends are using it, I would also use it. Like for Facebook."

In work environment? In a big company?

"I think that is better in a school environment because people are younger, they are growing and is the time for education. My opinion is that it would be more difficult to ask to a person of sixty years old to change his behaviour."

"However, if the company put some important prizes, it would be interesting to implement it because people will be driven by the prize. In this case, the majority of the employees would use it. And for me is the same."

"If there were not the real reward, I would use it only if also other people that I know will use it. Otherwise, I would never publish personal information, pictures with people that I do not know."

Game mechanics opinion

Rewards: "I would use it for the real prize."

Badges customisation: "I would not use it."

Donate: "This I found interesting"

Virtual gifts: "I would not use them."

Project: "The big issue with the project is that you cannot control if people really do the action."

"I would also give some coins if people do the activities in the project."

Collection coins: "I did not like the fact that in order to get the coins I had to post something in the community because I don't like to share my things. My question is also if people share stupid or not relevant information, how does it work? I think that the best article of the month is not an effective way to control what users publish in the community."

"In order to avoid that, it could be implement another voting system where there are negative vote. If people receive negative vote they will be penalize in terms of coins, like a bonus-malus system. However I wouldn't put that just a negative vote is determinant. It should be weighed and it should be an average. Otherwise if the person who votes has not good intention, he will give a negative vote just because he doesn't like that person."

"However I don't like games where my experience depends on the other."

Hearts: "The hearts did not disturb me too much. I think is important to have a system like this to bring back people in the project."

"The risk is that people go back in the project just to collect the hearts, in order to be able to receive the coins can be transformed in the real prize."

Wallet: "for me were not important the different colours and the fact of hiding the content of the wallet"

Green Trivia: "For me is correct that people have to answer all the question correctly in order to win something against the system"

Slot machine: "It was ok, it is a surprise, so I like it"


Against a friend: "I found ok the factor 1.5."

Badges/Achievement: "The badge did not appeal to me."

Leaderboards: "I found useful to motivate people to increase their points."

User 8

Profile

1) Use of social network: every day	8) Type of gamer: moderate gamer												
2) Rank of the activity: <table border="1"> <tr> <td>5</td><td>Share personal information</td></tr> <tr> <td>3</td><td>Share public information</td></tr> <tr> <td>2</td><td>Play games</td></tr> <tr> <td>4</td><td>Check profile of other users</td></tr> <tr> <td>6</td><td>Exchange private message</td></tr> <tr> <td>-</td><td>Others:</td></tr> </table>	5	Share personal information	3	Share public information	2	Play games	4	Check profile of other users	6	Exchange private message	-	Others:	6) 
5	Share personal information												
3	Share public information												
2	Play games												
4	Check profile of other users												
6	Exchange private message												
-	Others:												
3) Frequency of playing game: 1 or 2 times a week	9) Gender: male												
4) Game preference: with others people	10) Age: 21-23												
5) Play a game alone or with others:	11) Country (grow up): Spain												
7) Interest in games: considerable interest	12) Country (origin): Spain												

Interview

How did you find Living Green?

"I was very curious during the experience. However, I am not sure that I understood it completely."

Paper prototype was it realistic?

"It was realistic the experience and I would have love to try it on a real interface. Maybe it was simpler to understand it."

Was Living Green user friendly?

"It was very clear. It was easy to use, there was a good interactivity."

"Maybe at the beginning it was not straight forward, but I think after two, three times it will be very clear. It was simple to use."

Do you think is an effective tool to motivate people to do more sustainable actions?

"Maybe I would not do all the activities but some of them yes. I could do them. Then, with the community when I see also the others doing the activities, it could help to motivate me to do as well some sustainable activities."

"I would probably have a more sustainable behaviour than the current one."

Even if the tool cannot check you whether you do or not do the activity, would you do them?

"Depends on the person. For me, I would pay more attention at the sustainable dimension."

Would you use this tool if there was one in your school?

"I would for sure check it and try it. In the short term for sure, then on the mid-long term I don't know. I wouldn't use every day but I would start to use it and then maybe I will continue. I would start using it because I will be curious."

"The one that I saw now I think that it could be something that I could use."

"However, I think that it would be difficult that other students would use it because they are already busy studying and probably they would not care about it."

"It depends on the type of person. Maybe a person who already thinks about sustainability will use it. On the contrary, a person who is not interested, he would not use it."

In work environment? In a big company?

"I think it could work. It would be better than in a school because students are too young. In a company people are more responsible"

Game mechanics opinion

Rewards- Physical prize: "I would use it even without the physical prize. For me is not important."

Badge customisation: "I would change the colour of the badges. For me interesting because it gives me the possibility to have something different than the others. I think that badges are better than the colour of the wallet. Because I don't like to show off with the coins that I have in the wallet."

Donate: "I would probably donate the money to a friend. For example, if he wants to do something and he doesn't have enough coins, I would donate them. I would also donate to plant a tree."

Offer virtual gift: "Also this option I found it nice."

Projects: "They were ok."

Collection coins: "It is ok to have both points and coins. However, I paid more attention when the coins where increasing than the points because coins refers to money."

Final end test: "It is important to have it. It is more likely that with the test user will learn something. It would be a good idea to inform people about the different sustainable issue. Of course it depends on the content: it must be interesting."

Hearts: "For me they were not too binding."

Wallet: "For me the colour of the wallet was not an added value. If there were not the colour and I could see the amount of coins another user have it would not change my experience."

Green Trivia: "Maybe answering all the questions correctly is a bit too much. Maybe five or six correct answer would be more fair. Maybe is too much difficult."


Slot machine: "It is a good idea to have it."

Badges/Achievement: The badges were awesome. I would like to have them and show them to other users. I would check what the other users have.

Leaderboards: "It could motivate me even if it would be not the main reason that will motivate me participating at the project."

User 9

Profile

1) Use of social network: every day	8) Type of gamer: moderate gamer												
2) Rank of the activity: <table border="1"> <tr> <td>3</td><td>Share personal information</td></tr> <tr> <td>6</td><td>Share public information</td></tr> <tr> <td>2</td><td>Play games</td></tr> <tr> <td>4</td><td>Check profile of other users</td></tr> <tr> <td>5</td><td>Exchange private message</td></tr> <tr> <td>-</td><td>-</td></tr> </table>	3	Share personal information	6	Share public information	2	Play games	4	Check profile of other users	5	Exchange private message	-	-	6) 
3	Share personal information												
6	Share public information												
2	Play games												
4	Check profile of other users												
5	Exchange private message												
-	-												
3) Frequency of playing game: every day	9) Gender: female												
4) Game preference: games on mobile and sport	10) Age: 21-23												
5) Play a game alone or with others: alone	11) Country (grow up): Russia												
7) Interest in games: moderate interest	12) Country (origin): Russia												

Interview

How did you find Living Green?

"It was interesting, positive and curious. I was interested in understanding how this tool worked and what it could offer to me. "

Paper prototype was it realistic?

"Yes it was realistic because when I touched an icon I had a feedback. This type of test allows you to have a direct impact with the user. If you were doing it with a computer you would have missed this part. With the paper I managed to understand how the tool was working."

Was Living Green user friendly?

"On a scale I would be put it in the middle. Sometimes I couldn't understand immediately the idea of what I had to do. Maybe is because it was the first time. Probably in using it a few times it will become easier. "

"For example, when I interacted with the community, I lost one heart. At the beginning I could not understand it, but then after a few times I got it. But I think that is normal with new technology. Sometimes I use something new I don't understand right away how they work. After a while they become familiar."

Do you think is an effective tool to motivate people to do more sustainable actions?

"I would be more sensitive to some aspects and I would probably change some habits in my daily life. I will pay more attention to these aspects."

Even if the tool cannot check you whether you do or not do the activity, would you do them?

"I did not like it. The impression that I had is that I could just commit to do the activities, without doing them, just for collecting the points and the hearts. It is maybe too easy."

"You could add like a wall in Facebook where users have to report. First user say what they already do – because is possible that some actions users already do them - and what they commit to do. You can write what you are doing and tell to the others and you explain into details what you are doing. It is just an idea."

"Some stuff in the projects I already do. The other things that I don't know, just because I ticked the box and I committed to do them, this will bring me to do more sustainable actions when confronted in reality. For example, I commit to switch off the light at home. Then I do not do it right away but maybe after a few days I see the light on, I remember what I have seen in this tool and I would do it. I think that as tip is good in the long term."

Would you use this tool if there was one in your school?

"I am not sure. Maybe."

"I will probably start using it then I don't know if I will continue to use it. I would probably use it in the short term. Then depend on the community. If there is a good exchange maybe I will continue using it."

In work environment? In a big company?

"I think it could work. In addition to a virtual exchange of information, it could create also a good work environment."

Game mechanics opinion

Rewards- Physical prize: "For me are important the real prizes. Without them I would probably use the tool less often. It is a good thing to have real rewards. Without them I would get tired sooner because I don't have something concrete as a result. Unless that this coins are part of a game like Farmville that help me in going through the game. For example in Farmville I could use the coins to buy more houses. It could be that the game is more green but has the same objective. In this way, I would use it even without the real reward. However I prefer the real reward."

Badge customisation: "I liked the fact that is possible to customise the badges."

Virtual gift: "I would not use them"

Donate: Donate to a friend I do not see why I should do it. For charity yes I would do it. For example for the tree I would do it."

Project: "I like the idea of having the level because it gives the impression that the difficulty increases."

"A question that I have is: can I user propose new projects? Would it be possible to implement new projects? Would you reward other users that propose new projects? Or could users use Living Green to create new projects? Like users use the community for developing new projects? Like users decide to plan a sustainable event and they will inform people with Living Green?"

Use coins: "I see the points more as a status and the coins more as real money that I can use to get something. I think that is good to have both points and coins."

Collection coins: "One question that I have is: how are you going to control that the post in the community are relevant and linked to sustainability? That everybody is not going to post stupid stuff?"

Final end test: The test is a good way to check if users have learnt something or not. It is also a satisfaction for the user to pass a test from time to time."

Hearts: "At the beginning it was a limit when I wanted to comment or vote in the community that I needed a heart. In a way they are like a stimulus because without them you cannot interact with the community and so you have to go back in the project to get more hearts."

"I prefer to feel free to participate in the community and not to have a limit like the hearts. After a while I would probably leave the tool."

"For example, when I want to comment something and I don't have hearts, maybe I leave the tool because I don't have the time to go in the project. The next time that I login, I don't want to do the same comment because I don't feel in the same way. So, this I don't like."

"I understand why the hearts were done but probably after a while I will be fed up with them."

"Without the hearts I would go anyway in the project because if I register in a website like this, it is something that I want to do, to have a more sustainable life. I would use other solution to make users doing the sustainable projects."

Wallet: “The colours were a good idea even if I would adapt them to sustainable colour. Like the wallet with more coins should be green.”

“If somebody has a more important wallet he has more prestige. It means that the person is very involved, but it could also mean that he is mean because he doesn’t use the coins. Anyway I would think that is a person who is very active with the use of the tool and that he knows about sustainability. I could also ask for sustainable tips to this person.”

Green Trivia: “Answering seven questions correctly is not a problem.”

Slot machine: “I did not really understand the goal of the slot machine. I did not like it. I would be happy to win even without the slot machine. I am assuming that if I answer correctly all the answer I will win anyway something. So I don’t need an additional slot machine that tells me how much I win.”

“When a play against another user I would do that the winning is multiplied by a factor of two and not 1.5. But also 1.5 was not too bad.”

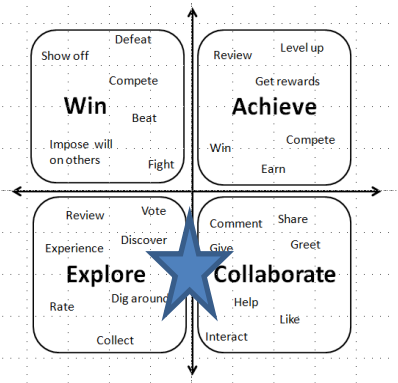
Badges/Achievement: “This is a good idea. It is a way to be different than the others. I also like the fact that is possible to customise them.”

“Having a badge is a way to show to the others that I have reached something. It is satisfactory because it shows that you are following the goal of Living Green.”

Leaderboards: “It motivates me to have more points and it is a good idea to have it.”

User 10

Profile

1) Use of social network: every day	8) Type of gamer: moderate gamer												
2) Rank of the activity: <table border="1"> <tr> <td>6</td><td>Share personal information</td></tr> <tr> <td>2</td><td>Share public information</td></tr> <tr> <td>3</td><td>Play games</td></tr> <tr> <td>5</td><td>Check profile of other users</td></tr> <tr> <td>4</td><td>Exchange private message</td></tr> <tr> <td>-</td><td>Others:</td></tr> </table>	6	Share personal information	2	Share public information	3	Play games	5	Check profile of other users	4	Exchange private message	-	Others:	6) 
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3	Play games												
5	Check profile of other users												
4	Exchange private message												
-	Others:												
3) Frequency of playing game: 1 or 2 times a week	9) Gender: female												
4) Game preference: games on mobile	10) Age: 24-26												
5) Play a game alone or with others: with others	11) Country (grow up): Germany												
7) Interest in games: moderate interest	12) Country (origin): Germany												

Interview

How did you find Living Green?

"I think that the tool is very intuitive. It was an interesting experience and it was very user-friendly."

What about the paper prototype?

"It was quite realistic even if it was on a paper. At the beginning was a bit slow, but when you get used to it, it's like a real website."

Was Living Green user friendly?

"It is simple to use. The buttons are easy to identify."

Do you think is an effective tool to motivate people to do more sustainable actions?

"I think it is a good idea to help people having a sustainable lifestyle. I am not sure that I will do everything. Some activities I found too easy. Some others require too much efforts. For example, I live outside the city centre and for me would be too difficult to move just with the public transport. By car it takes five minutes. If I have to wait for the bus my day will be very long."

Even if the tool cannot check you whether you do or not do the activities, would you do them?

"This could be a risk. However I think that people that will use it, will be people that are interested in sustainability, therefore it could work even without a control. "

"If you find a way to control the activities it would be better. "

Would you use this tool if there was one in your school

"Yes I think it could be a good, fun. I think that it would also be good to know other students. Then I am not sure that I will always do the activities but I will give for sure a try."

Game mechanics opinion

Physical Rewards: "I think that for many people real rewards are very important. I would use it even without them. Then, if I have enough coins and there will be the prizes I will probably use them."

Virtual gift: "I will try them. It could be fun."

Customise badge: "They are ok but I am not very interested."

Donate: "I will probably donate them to plant trees."

Hearts: "I understand the purpose of putting them but I personally did not like them. Maybe is because we are used in social networks to post everything without limits. For me was not the best idea."

Project: "For me is important that the activities in the project are interesting. So, if the app tells me already what I am doing, it will be not very useful for me. In addition, some others activities I would not be able to do because of my personal situation."

"I think that in general they were good, but some activities must be changed."

Collection coins: "I liked that there is the best article and best picture of the months. Personally I am already a person that likes to post in social networks. And if I am rewarded with coins, even better."

Colour of the wallet: "It doesn't change my life."

Test end level: I found it interesting. It is a simple and good way to inform users about sustainable issues.

Green Trivia: "I found it interesting and I think that it will appeal to many users. But it is not for me."

Badges/Achievement: "They were good and I liked them. I would like to finish the level to get them."

Leaderboards: "I did not like it. I am sure that most of my friends would like the ranking, but it is not something that I like. To be honest I am neutral. If there is, I am not paying attention to it and it does not disturb me. "